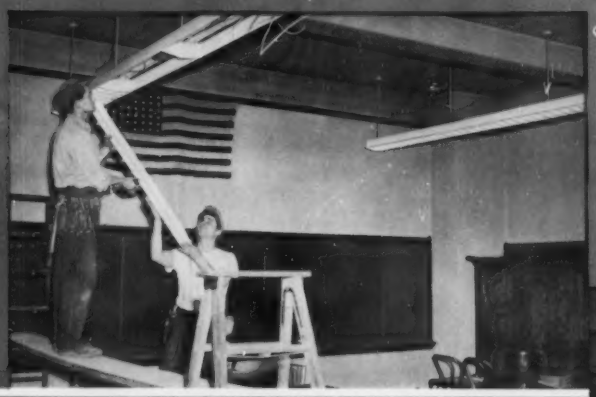
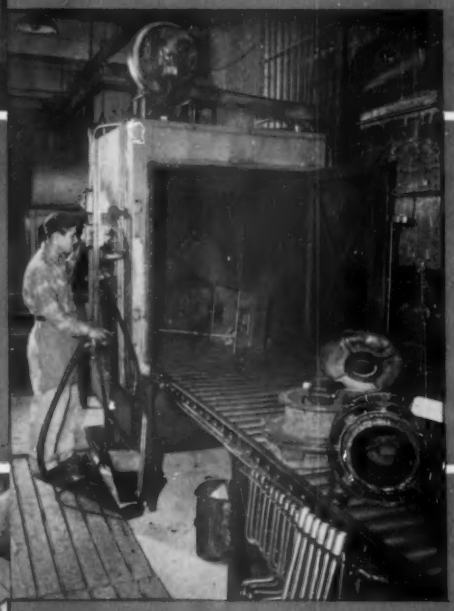
MAY · 1954
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



Four-year program ups lighting to 30-fc minimum through Canton's 30-school system . . .
page 88



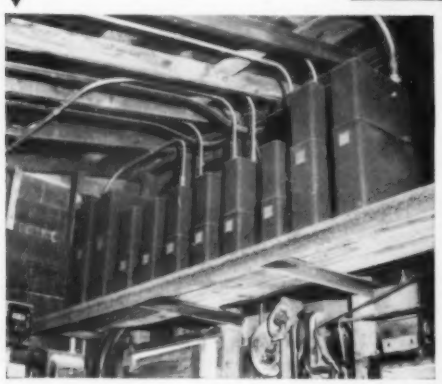
Motor shops ready latest Detroit service techniques for NISA Convention visitors. . .
page 83

How modern lighting means better life, better work in progressive Los Angeles . . .
page 98

A McGRAW-HILL PUBLICATION | 53RD YEAR

VOLTAGE REGULATION, one of the benefits from using G-E Capacitors, assures top efficiency and long life from motors (right) driving conveyors and crushers at Dubuque Stone Products Co., Dubuque, Iowa.

OUT OF THE WAY on rack in switching house, bank of G-E Capacitors for conveyor motors are part of installation totaling 140 kvar. Others are mounted at load. All assure longer motor life.



Stone Products Company cuts power bills, improves voltage with G-E capacitors

Dubuque Stone Products Co. raises power factor from 66% to 99%— power-bill savings pay for installation in less than a year.

Power factor at Dubuque Stone Products Co., Dubuque, Iowa, jumped from a 66% average to 99% when G-E capacitors were installed. As a result, they're taking advantage of all the power they're paying for. Capacity has been increased without new transformers or wiring. Improved voltage regulation has brought efficient motor operation for longer, more economical motor life.

Total cost including installation was $1,830.57. "And they'll more than pay for themselves out of power-bill savings during the first year," reports Mr. Paul Nauman, general manager of the company. G-E Capacitors will continue to save in the same way for many years more.

Low power factor may be costing you money. Investigate your electric power contract to see if there's a kva-demand or power-factor clause. Find out how you can start saving with G-E Capacitors by calling your nearest G-E Apparatus Sales Office or authorized agent. Ask for a copy of "How to Use Capacitors to Reduce Power Costs," or write for bulletin GEA-5632, to Section 441-105, General Electric Company, Schenectady 5, New York.

You can put your confidence in—

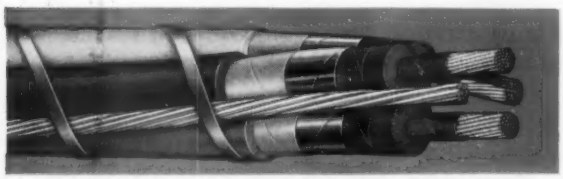
GENERAL ELECTRIC

Ordinary rubber can't handle OZONE

You need U. S. GRIZZLY Uskorona-insulated Power Cables

Here's an illustration showing how ozone can chew up a sturdy, rugged cable. This can never happen with United States Rubber Company's famous Grizzly® Power Cables insulated with Uskorona® compound which prevents electrical failure caused by ozone (Uskorona-1 oil base compound or Uskorona-2 butyl rubber compound). Uskorona meets (and in many ways exceeds) the applicable IPCEA specifications for ozone-resistant rubber insulation.

As the only wire manufacturer that grows its own natural rubber, produces its own synthetics and makes its own plastics (as well as the bulk of its own rubber-compounding chemicals and ingredients), United States Rubber Company is able to make certain that only the finest materials are used in the insulations for its wires and cables. These materials are expertly compounded according to methods devised after years of research and experimentation in "U.S." laboratories. Finally, U.S. Rubber's practical "know-how" contributes its important part to the uniform high quality of every "U.S." insulation. This "know-how" is the result of 68 years of successful manufacture of electrical wires and cables, and over a century in the making of fine rubber products.



U. S. Grizzly Uskorona-insulated Power Cable, 5,000 Volts, type RR 3 conductor, shielded, Neoprene jacket.

Send for free catalog giving full information about U. S. Electrical Wires and Cables

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPARTMENT ROCKEFELLER CENTER, NEW YORK 20, N. Y.

US RUBBER

APPLETON

"ST" Series CONNECTORS*

for

Liquid Tight Flexible Conduit

("Sealtite" or Equivalent Products)

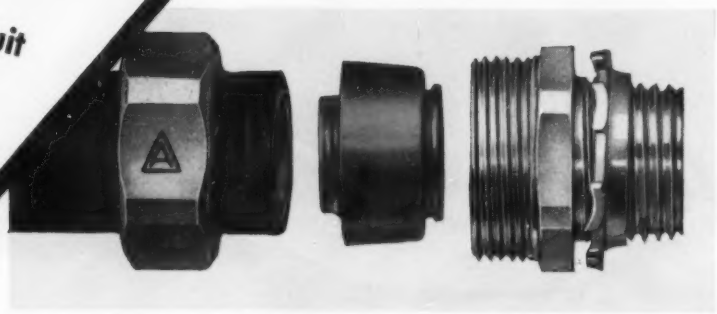
*Patent Applied For

UNIQUE

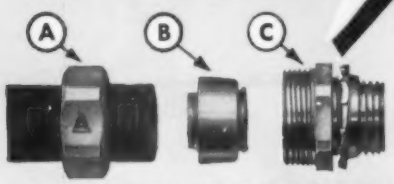
Patented Construction

No Other Liquid Tight Flexible Conduit Connectors Have The APPLETON Brass Ferrule. Ferrule Screws In and Crimps On For a Perfect Seal and Positive Ground

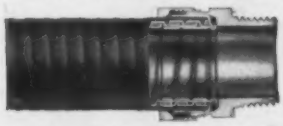
... Always!



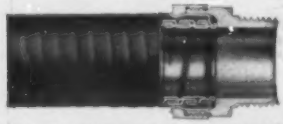
HERE'S HOW THEY WORK:



Slide nut (A) over conduit. Screw ferrule and sleeve assembly (B) into conduit. Tighten nut onto connector body (C).



Completely assembled "ST" connection. (IMPORTANT: nut must be tightened as far as possible to complete compression action which assures liquid-tight seal.)



Cross section of completed connection shows how tapered end of nut compresses ferrule wall . . . seals perfectly and gives positive ground between conduit and connector.

The Only Fittings of their Kind . . . Provide *Positive* Wiring System Protection

Here are flexible conduit connectors with a big plus! Nothing to come loose, deteriorate, crack or break! Patented ferrule *Appleton* "ST" Series Connectors stay tight to assure positive exclusion of liquids, fumes, chips, shavings and other foreign matter from machinery electrical systems. And since the threaded, brass ferrule is crimped on, there is a *permanent* ground between conduit and connectors that maintains voltage unfailingly within 10 millivolts drop.

Appleton "ST" Series Connectors come straight to fit flexible conduit from ⅜" to 4". Also, 45° and 90° to fit flexible conduit from ⅜" to 2". To avoid costly shutdowns and loss of man hours, due to wiring system failure, *write for full information.*

A QUALITY LINE OF ELECTRICAL FITTINGS ALL FROM ONE SOURCE SOLD THROUGH ELECTRICAL WHOLESALERS ONLY

APPLETON ELECTRIC COMPANY

1704 Wellington Avenue • Chicago 13, Illinois

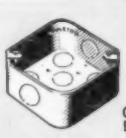
Also Manufacturers of

Explosion-Proof Fixtures

Unilet Fittings

Industrial Lights

Reelites


Outlet Boxes

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electrogist and Electrical Record — Established 1901

53rd Year MAY • 1954

Washington Report 77

At a Glance 79

Encourage Unit Cooling, *An Editorial* 81

Detroit Motor Shop Techniques 83
Shop visits offer delegates to the NISA Convention a chance to see ideas developed by repair specialists to improve workmanship and customer service in Detroit area.

Canton's Program of School Relighting and Rewiring 88
By R. L. SPRING—Average classroom illumination in public schools is more than tripled. Long-range project involves fluorescent lighting, heavier services and feeders and more branch circuits.

Light and Power for a Library 92
By C. D. DRAUCKER—An on-the-job report of power and light wiring, equipment layouts, installation details of the Los Angeles County Law Library.

Green Light for St. Louis Contractors on Electric Space Heating 95
Contractors' market for electric space heating installations in St. Louis is given new impetus by utility data on local load requirements and encouragement of electric heating.

Light's Role in Los Angeles 98
Light decorates city's boulevards at night, dramatizes displays, speeds commercial and industrial work by day.

Cartoons Ridicule "Do-it-yourself" Wiring 100

New Plants and Equipment 101
Capital expenditures for manufacturing industry capacity expansion will continue at high rate over next four years, if current plans disclosed by McGraw-Hill's seventh annual survey are carried out.

L-V Switching Solves Control Problem 104
By MARIO G. ZERVIGON—Low voltage remote control switching system provides master control from basement for individual air conditioning units in new medical building.

MORE

MAY • 1954 *continued*

At the Test Bench—I 106

By W. J. PRISE—A series of tests made on a typical three point starter.

Commercial High-Voltage Installations—Part II 108

By D. L. BEEMAN and H. D. KURT—Some convincing arguments for high-voltage distribution in commercial structures.

Detroit's Electrical Contractors' Services Program 112

By H. E. COOK—Detroit's program taps the residential market, speeds trouble call service, helps upgrade home wiring.

Modern School Wiring 114

By JAMES L. DELLOS—Modern, functional, electrical distribution and application highlight construction of multi-building type school in Burlingame, Calif.

Motor Shops 127

Electric impact wrench is timesaver; check list speeds motor checking in; cleaning tank distills own solvent.

Practical Methods 135

Hand trucks cut material handling costs; cast sleeves support multiple conduit risers; jeep proves to be versatile workhorse.

Modern Lighting 143

Lumnious ceiling modernizes old kitchen; department store applies practical lighting formula; church chancel features back-lighted window.

Reader Service 151

Product news announcements; catalogs and bulletins.

Reader's Quiz 193

Questions and answers on speed reduction in shaded pole motors; lamp replacement schedule; electronic tubes.

Questions on the Code 201

Answers to code questions including several motors—one branch circuit; aluminum conductors; service entrance fuses.

In the News 217

Dates Ahead 241

W. T. STUART, *Editor*

Alice McMullen, *Associate Editor*

Berlon C. Cooper, *Eastern Editor*

August Eckel, *Middle West Editor*

Hugh P. Scott, *Industrial Editor*

J. F. McPartland, Jr., *Assistant Editor*

W. J. Novak, *Assistant Editor*

John P. Reynolds, *Assistant Editor*

Harry Phillips, *Art Editor*

W. A. Cyr, *Pacific Coast Editor*

Ray Ashley, B. A. McDonald, Walter J. Prise, Glenn Rowell, B. Z. Segall, *Consulting Editors*

Dexter Keezer, *Dir. Economic Staff*

George B. Bryant, Jr., *Chief Correspondent, Washington Bureau*

Joseph K. Van Denburg, Jr., *Editor, World News*

W. W. GAREY, *Publisher*

District Managers

A. B. Conklin, *New York*

S. A. Jones, *New York*

L. S. Kelley, Jr., *Philadelphia*

F. J. Seiler, *Cleveland*

Charles F. Minor, Jr., *Chicago*

R. R. Ream, *Chicago*

T. H. Carmody, *San Francisco*

C. W. Dysinger, *Los Angeles*

J. H. Cash, *Dallas*

R. H. Sidur, *Atlanta*

Member of
AUDIT BUREAU OF CIRCULATIONS and
ASSOCIATED BUSINESS PUBLICATIONS

Vol. 53, No. 5 ELECTRICAL CONSTRUCTION and MAINTENANCE May 1954

Published monthly with an additional issue in September by McGraw-Hill Publishing Company Inc. James H. McGraw (1860-1948), Founder. Publication Office, 99-129 North Broadway, Albany 1, N.Y.

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to Electrical Construction and Maintenance—Subscription Service, 99-129 N. Bway., Albany 1, N.Y. or 330 W. 42nd St., New York 36, N.Y. Allow one month for change of address.

Subscriptions are solicited only from persons engaged in electrical construction or electrical maintenance. Position and company connection must be indicated on subscription orders.

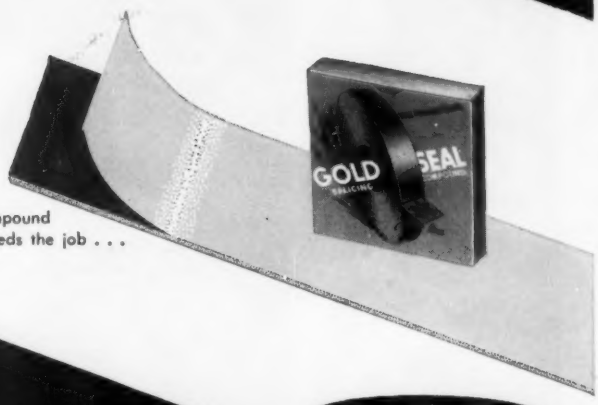
Single copies 35c. Electrical Products Guide $2.50 to those in the electrical construction and maintenance industry. Subscription rates—United States and possessions, $3.00 a year; $4.00 for two years. Canada, $5.00 a year; $8.00 for two years. Other Western Hemisphere, $10.00 for one year; $16.00 for two years. All other countries, $15.00 a year. Entered as second class matter August 29, 1938, at the Post Office at Albany, N.Y., under act of Mar. 3, 1879. Printed in U.S.A.

Copyright 1954 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

three tapes
...one quality

GOLD SEAL

FRICTION
Get the most "coverage" for your money with tape that goes *further* . . . say Gold Seal.



RUBBER
Get the splicing compound that sticks fast, speeds the job . . . say Gold Seal.

PLASTIC Get Gold Seal quality in plastic electrical tape. Highly elastic, it "flows" on to cover any surface snugly. Neat, thin wrapping gives all needed dielectric on most jobs. Sticks on — stays on — resists sunlight and weather — defies water, oil, solvents. Single 60 ft. rolls, cellophane protected, are packed in round metal cans. "Tape-saver" 20 ft. rolls, sized to meet average job needs and "swing" easy in tight places, are packed in 10-roll Handy Pack containers. Sample free on request. Jenkins Bros., Rubber Division, 100 Park Ave., New York 17.

JENKINS

Gold Seal Tape

FRICTION • RUBBER • PLASTIC

Also Diamond Seal Friction and Rubber Tapes made to ASTM Specifications. Products of Jenkins Bros. — makers of famous Jenkins Valves.

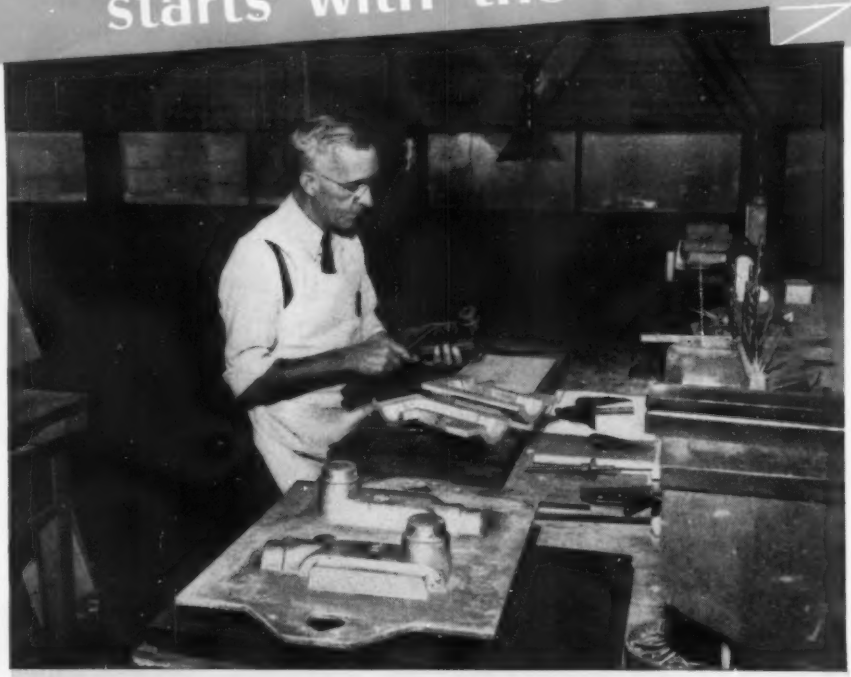
CROUSE-HINDS quality starts with the casting

Type FLB Explosion-Proof Circuit Breaker Condulet

Type ARE Plug Receptacle With Spring Door

Type GUAC Explosion-Proof Junction Condulet

Type LB Obround Condulet



1. A highly skilled patternmaker, with long years of experience in precision craftsmanship puts the finishing touches on an Obround CONDULET master pattern.

They're made right to serve you better.

Working from designs that have been carefully developed in the Engineering Dept., expert pattern-makers make the master patterns. Perfect workmanship is a tradition in Crouse-Hinds Pattern Dept., where half the workers have records of from twenty-five to more than forty years of service.

Crouse-Hinds Iron Foundry is one of the largest and best equipped of its kind. It has the latest mechanical improvements to enable the skilled molders to produce the best possible castings. Most CONDULETS are made of Feraloy, Crouse-Hinds special alloy having the desirable characteristics of both cast steel and gray iron. It is strong, tough, holds its shape, is inherently corrosion resisting, homogeneous, and machines well, giving sharp, full threads.

To maintain Crouse-Hinds high standard of quality there is constant checking and testing. In the Foundry Control Laboratory, core and molding sands and oils are examined. Only the best are used. Continual temperature readings of molten Feraloy are taken, and test bars are made and tested for strength in the Mechanical Laboratory. The Chemical Laboratory makes daily analyses of the Feraloy output of the foundry.

Crouse-Hinds Non-Ferrous Foundry is equipped to turn out high quality castings of aluminum, bronze, and other metals.

When quality counts use CONDULETS. They're made right . . . to serve you better . . . and last longer.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis — New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Tulsa — Washington.
RESIDENT REPRESENTATIVES: Albany — Atlanta — Baltimore — Charlotte — Corpus Christi — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

CONDULETS · TRAFFIC SIGNALS

. . . and goes thru every step

That's why CONDULETS* last longer

2. Expert molders operate the molding machines in Crouse-Hinds modern foundry. Sand hoppers are shown at top.

3. Molten Feraloy is poured into the molds from a distributing ladle in Crouse-Hinds mechanized foundry.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CONDULET
First in the field
STANDARD OF QUALITY
A Nationwide Distribution Through Electrical Distributors

FLOODLIGHTS • AIRPORT LIGHTING

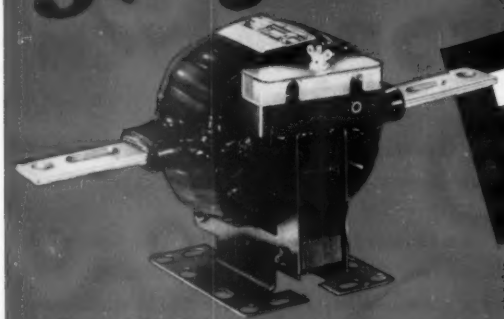
Since even the small homes you wire will have one or more telephones,
And since most homeowners want concealed telephone wiring,
Isn't it good practice to include conduit for telephone wires
in all your wiring contracts for new or remodeled homes?

Your Bell Telephone Company will be glad to help you work out economical conduit installations. Just call your nearest Business Office.

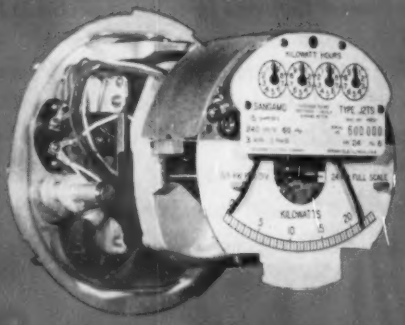
BELL TELEPHONE SYSTEM

SANGAMO

Safeguards Performance with NATVAR 400



Sangamo Type MA-25 Current Transformers are designed for indoor service on metering applications. They are wound type with single primary and single secondary, and meet A.S.A. 2.5 KV insulation class test requirements—15 KV at 60 cycles and 45 KV full wave impulse. Natvar 400 Extruded Vinyl Tape is used "because of high insulation value, resistance to heat and ability to form itself to the shape of parts being insulated."



Sangamo Single phase combination Watthour and Demand Meters like the Type J2TS illustrated are built and tested for sustained accuracy under varying temperatures, ease of calibration and repair, resistance to corrosive atmosphere, and ample capacity to measure heavy loads. Natvar 400 Extruded Vinyl Tubing is used for insulation because it meets the requirements with plenty to spare.

Sangamo is one of the most respected names in the electrical industry. For more than fifty years Sangamo meters have measured electricity with great accuracy, have required little maintenance, and have been easy to test and repair. Meters and associated equipment are made in the Sangamo Electric Company plant in Springfield, Illinois.

They safeguard performance through good design for each requirement, individual tests at various stages of manufacture, and careful selection of materials. Natvar 400 Extruded Vinyl Tubing and Tape are used because of their uniformly good electrical and physical properties—particularly the ability to resist heat, oil, corrosive atmosphere and abrasion.

All Natvar flexible insulations are uniformly dependable no matter where or when purchased. They are available either from your wholesalers' stock or direct from our own.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Varnished-lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 22

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800

CABLE ADDRESS NATVAR: RAHWAY, N. J.

205 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

Dual-Element Cartridge FUSES

*Trade Mark Reg.

. . . carry their own "STOP WATCH"

You get extra protection against overloads and "shorts" with ECON Dual-Element Cartridge Fuses.

Because on a sustained overload, heat from the fusible links is conducted into the Econ-alloy time-lag element. If the overload is continued *beyond the safe and predetermined time*, the heat causes the Econ-alloy to become liquid and release from the fusible links, thereby opening the circuit.

On a short circuit, the fusible links open the circuit immediately before dangerous pressures can be developed.

ECON Dual-Element Cartridge Fuses are available in knife and ferrule types; 0 to 600 amperes; 250 and 600 Volts. Underwriters' Laboratories, Inc. Approved. Carried in stock by leading Electrical Wholesalers. Write for New ECON Catalog S-60 or for literature on other type fuses in which you are interested.

☆ ☆ ☆

Your Electrical Wholesaler has ECON Dual-Element Cartridge Fuses in stock

ECONOMY fuses for every purpose

ECONOMY FUSE & MANUFACTURING CO.

2717 GREENVIEW AVE. • CHICAGO 14, ILLINOIS

ANHYDROPRENE *for* CRYING-OUT-LOUD!

Your plant communication system serves one purpose: "To cry out loud." Relaying of signals or information from one plant location to another can be of vital importance. Wiring for such a system should be as dependable and efficient as money can buy.

To make sure it is, wire your plant communication system with Simplex-ANHYDROPRENE Wire. ANHYDROPRENE combines famous Anhydrex insulation, water resistance and neoprene jacket toughness. It's designed to replace braided or taped wires.

Anhydrex insulation has high dielectric strength, low water absorption, and remarkably stable electrical and physical properties. The neoprene jacket resists sunlight, oil, acids, heat, flame, fungus growth, and mildew.

ANHYDROPRENE Wire is used for plant, shop, and instrument wiring, control and signal circuits, underground primaries, transformer leads, and pole line risers. Write today for Bulletin 115 to the address below.

Simplex ANHYDROPRENE

another product of

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

ALL THE FEATURES *plus*....

SQUARE D's
NEW
POWER-STYLE

SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY OR AS A TEAM....

Write for Bulletin SD-18. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

SQUARE D COMPANY

MATCHED ENCLOSURES!

SQUARE D's
NEW
PLUG-IN

CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

....THEY DO THE JOB BETTER!

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

B-M Fittings

THE ORIGINAL INDENTER TYPE E.M.T. COUPLINGS AND CONNECTORS

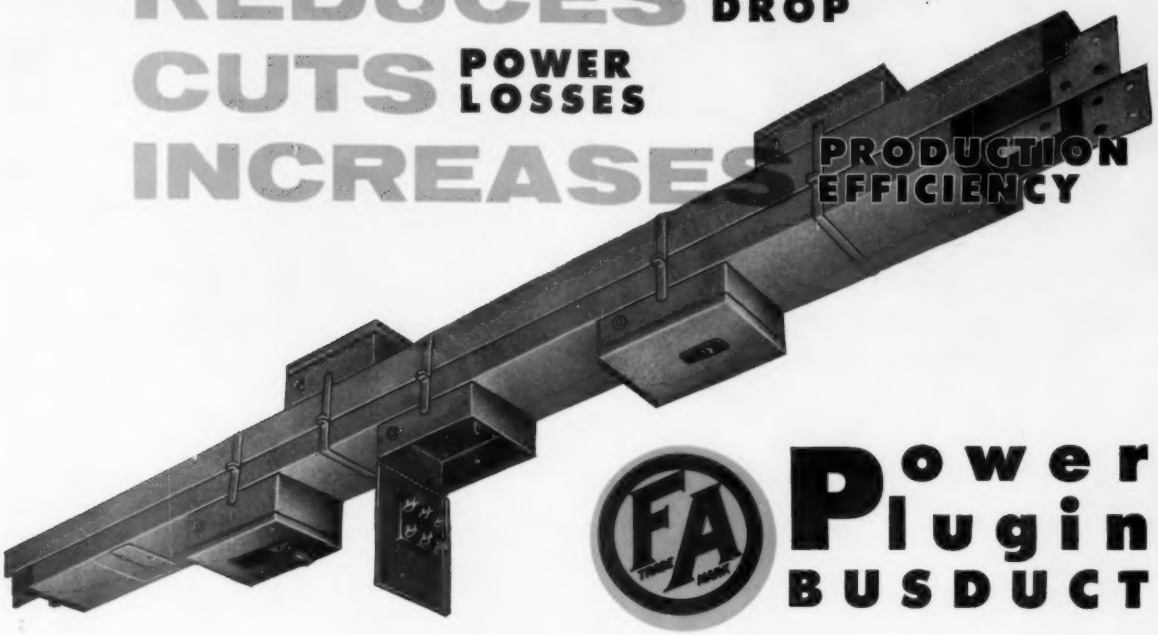
Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

All B-M Indenter Fittings are U. L. approved as Concrete-tight and for General Use. (File Card E 10863)

BRIEGEL METHOD TOOL CO.
GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

REDUCES VOLTAGE DROP
CUTS POWER LOSSES
INCREASES PRODUCTION EFFICIENCY



FA Power Plugin BUSDUCT

WITH EITHER COPPER OR ALUMINUM CONDUCTORS

Recommend this safe, dependable system of power distribution to all your customers who want maximum efficiency and economy of plant operation. They will find it one of the best investments they ever made in the future of their business.

Ⓕ **POWERPLUGIN** Busduct has been designed specifically to give greater flexibility and efficiency to all plant operations by making power available where and when it is needed. It also reduces voltage loss to a minimum by eliminating long lead-ins, cuts maintenance costs and provides other savings. Too, it is 100 percent salvageable.

Approved by the Underwriters' Laboratories, Inc., for label service, Ⓕ Powerplugin is made in standard 10 foot lengths with a plug-in outlet every foot of the way or alternately on two sides. It enables machines to be re-located or regrouped without disrupting production, thus facilitating plant operation.

Another feature is that it can be arranged to fit almost any electrical requirement. Sections can be run horizontal or vertical, at floor level or overhead.

Capacities of Ⓕ Powerplugin are 250 to 1,000 amps (1,200 and 1,500 amps also available), 600 volts AC or less with Klampswitchfuz, Shutlbrak or Circuit Breaker plugin units for 200 amps or less.

For the company planning a new plant or modernization of an existing plant, Ⓕ Powerplugin is a "natural." Recommend it to your customers. For additional information about this more efficient, flexible system of power distribution, see your nearest Ⓕ representative, listed in Sweet's, or contact your Ⓕ distributors. Or write for Bulletin No. 720.

Features of Ⓕ Powerplugin

Ⓕ Powerplugin is made of 16 gauge steel with attractive pearl gray enamel finish. Insulators are one piece glazed porcelain with steel channel supports riveted into position.

Flush type, hinged cover plug-in openings, simplified, adjustable, two screw type fasteners for plug-in units, two sliding type mounting brackets per section for hanging as desired, electro-silver plated contact surfaces at joints with two or four brass jam bolts with phosphor bronze cup washers in elongated fastening holes are other features. Either Copper or Aluminum Conductors available.

BOX 357, MAIN P. O.
ST. LOUIS, MISSOURI

Frank Adam Electric Co.

Makers of: BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

Modernize your warning signal system with this

NEW extra-compact yet powerful siren!

...Sounds the Alarm Against such Enemies as: Slowed-up Production, Sabotage, Fire, Air Raids, etc.

FREE! *The Most Complete Book on Signaling!*

Especially designed for new Multiple-Signal Installations which overcome problems of atmospheric conditions, wind direction and industrial din!

The modern trend towards the use of a number of small-yet-powerful signals instead of trying to obtain satisfactory coverage with one bulky 2 to 5 h.p. device, calls for a review of your warning signal system. The new Benjamin Siren is especially engineered to help modernize your system in line with latest approved sound signal practices. It features extra-compact design due to its small-yet-powerful high-torque, 10,000 r.p.m. motor and precision-machined, compact housing. Famous Benjamin built-like-a-battleship construction prevents moisture from entering and assures long, trouble-free operation.

The new Benjamin Siren is one of many Benjamin Signals which help you modernize your signal system. All of them are shown and described in the 48-page Signal Book, which also includes signal application data, glossary of signal terms, details on how to set up a system, and other valuable information to help you modernize your signaling. Send for your copy now...there is no cost or obligation.

for Signal Success Specify BENJAMIN Sound Signals

A Product of the Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill., makers of famous Benjamin and Leader Line Lighting equipment and sound signals, for Industry, Institutions and Commerce.

G-557J

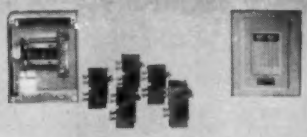
Modern Low-Cost Circuit Protection

The new Cutler-Hammer Unit Breaker—the Unit System Circuit Protector—has everything you want—low price, top convenience in stocking, in selecting proper circuit breaker capacities for a specific home or other buildings, rapid, easy installation and wall-switch snap-on, to restore service.

The Cutler-Hammer Unit Breaker is 3 simple components. The case with bus bar assembly. The individual circuit breaker in 15, 20, 30, 40 and 50 amp. capacities that the contractor just picks out and pushes in. And the cover for flush or surface mounting. 6 case sizes handle any circuit combination from 1 to 32 circuits. There are many other features too—plus *genuine Cutler-Hammer quality* at new low prices.

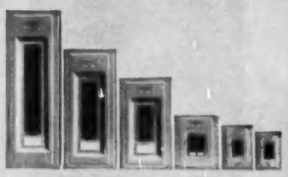
See this new Unit System Circuit Protector. Get the whole story including the new pocket size Handilog and selector charts. Don't delay. Cash in. Contractors, see your authorized Cutler-Hammer distributor *today*. CUTLER-HAMMER, Inc., 1306 W. St. Paul Avenue, Milwaukee 1, Wisconsin.

CUTLER-HAMMER
UNIT BREAKER
C-H



Basically 3 Components

The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



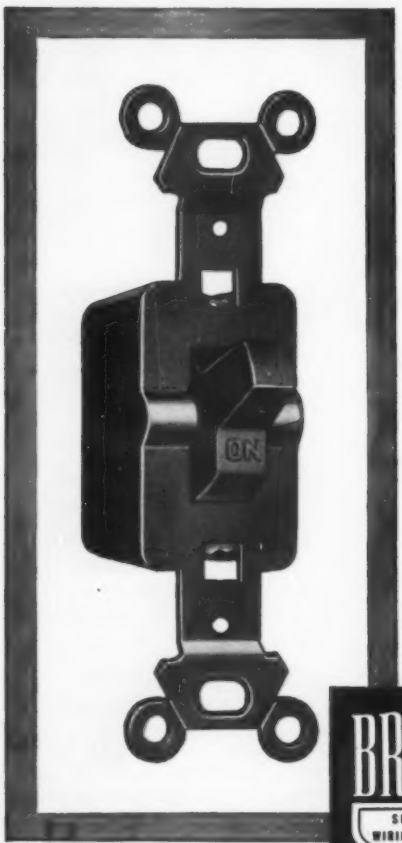
6 Cases—32 Circuits

Only 6 case sizes handle all needs to 32 circuits. Also raintight and special types available.

Rock Bottom Prices Plus These Features

Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.

IT'S NEW!
IT'S QUIET!
UNLIMITED LIFE!



The Bryant 4501 "A.C." Switch Line with Spring Grip Terminals

15 AMPERES • 120 VOLTS

QUIET—practically silent in operation

UNLIMITED LIFE—when used to full rated capacity on tungsten filament and fluorescent lamp loads.

LOWER INSTALLED COST—equipped with spring grip terminals for easier, faster wiring. Simply insert stripped wire in the hole — connection is completed.

OTHER QUALITY FEATURES

Silver contacts

Mechanism completely enclosed in strong plastic cup

Shockproof, unexposed terminal connections

Standard screwdriver pressure release of wires.

All add up to a "QUALITY" switch for long life and faster wiring.

Available in single pole and 3-way, brown or ivory handles.

BRYANT
SUPERIOR WIRING DEVICES

THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

Chicago • Los Angeles

J99905

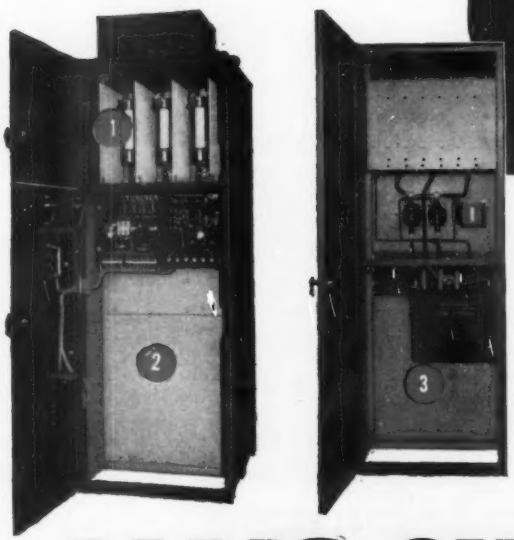
Personnel Protection

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

THROUGH SEGREGATED HIGH VOLTAGE COMPARTMENTS

For positive personnel protection, high voltages are completely segregated in the Allis-Chalmers Type H starter. Full width, heavy sheet steel barriers separate the front low voltage compartment from the rear high voltage equipment and from the upper fuse compartment. It will pay you to get all the details from your nearby A-C representative or by writing Allis-Chalmers, Milwaukee 1, Wisconsin.

Current limiting fuses are easily removed with hook stick. Safety door interlocks take motor off line when fuse compartment door is opened.



3 Compartments Assure Safety

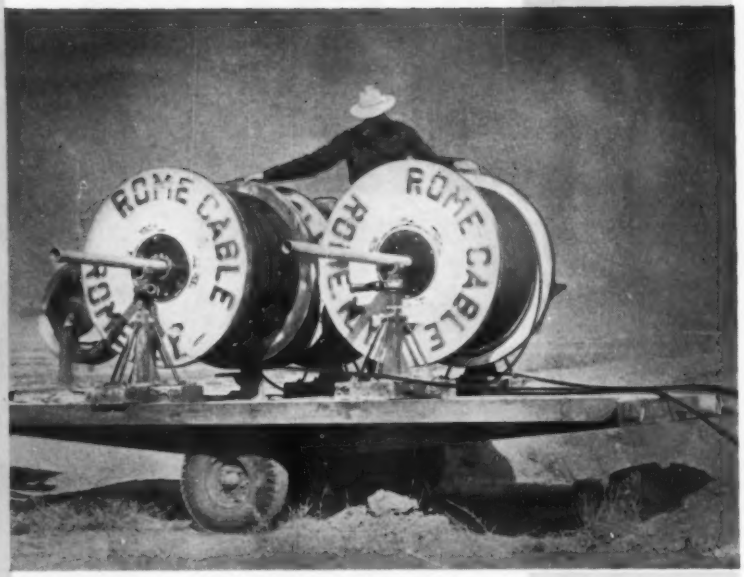
The heavy gauge steel cubicle is divided into three compartments for maximum safety. **1** — Upper front compartment encloses disconnect type fuse. The same operation which puts fuse in position for removal isolates starter from line. **2** — Lower front compartment houses low voltage control devices. **3** — Rear compartment contains high voltage equipment, contactors, buses, instruments, transformers, etc.

A-4002

ALLIS-CHALMERS

They couldn't afford less

Trench digger breaks ground for laying of 5 KV RoZone-RoPrene power cables to supply runway lights.



RoZone-RoPrene power cable being reeled off and laid in trench.

All-resistant RoPrene sheath and moisture-resistant RoZone insulation permit direct earth burial. Note "counterpoise" wire for lightning protection.

In this installation cables were covered with three inches of sand to prevent mechanical damage from rocks, etc.

than the best cable

at Salt Lake City

Whether you are selling or installing airport wiring, bear in mind that the buyer has two prerequisites (1) dependability, (2) long-time economy.

The Salt Lake City Municipal Airport is a case in point. Here, 5 KV RoZone-RoPrene (CAA-L-824, Type B) airport lighting cable was specified for several reasons.

Its premium quality oil base insulation (RoZone) assures exceptional protection against operating temperatures and moisture. High impulse strength aids against lightning damage.

At the same time, its Neoprene (RoPrene) sheath resists the attack of soil acids, oils, greases, alkalies, moisture and flame. These features, plus inherent toughness, permit direct burial in earth.

The contractor also realizes considerable cost savings because of easy installation. Both RoZone-RoPrene and RoMarine (specially compounded rubber insulation)-Ro-Prene (CAA Type A) eliminate costly man hours.

They are especially easy to tap and splice. Simple manual connections eliminate potheads and stress cones.

But, regardless of whether you are selling or installing cable in airports, industrial plants, buildings, homes or farms, your reputation insists that you take *no less than the best.* Standardize on Rome wires and cables. Mail the coupon for your free copy of the Rome Power and Control Cable Catalog.

Installation: Salt Lake City Municipal Airport.

Electrical Contractor: Thompson Electric, Salt Lake City.

RoZone-RoPrene was the first cable construction to be approved as Type B under CAA Specification L-824.

RoMarine-RoPrene was the first cable construction to be approved as Type A under CAA Specification L-824.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE, ROME, N.Y.

ROME CABLE CORP., Dept. EC-5, Rome, N. Y.

Please send me the Rome Power and Control Cable Catalog.

Name .....

Company .....

Address .....

City ..... State .....

now!

McGILL® offers you a complete line of GROUNDED PORTABLE LIGHTING

UL

complies with modern 3-wire systems

completely insulated and shockproof

approved 3-wire convenience outlet

impact resisting moulded phenolic handle

model 5025 SLRG

You can now have the safety and convenience of a completely grounded lamp guard equipped with an approved 3-wire convenience outlet. The McGill 5000-G Series portables give you all the light you can use and in addition provide a ready connection for grounding drills, soldering irons, saws or other power tools quickly at the working area . . . without extra extension cords.

McGill grounded guards are available with either the standard closed end cage and reflector or with an open end cage with concentrating end lens (as pictured) to beam light — and rotary reflector. Other models are available with or without convenience outlet, switch, and 25′ to 50′ of red 16-3 SJT Thermoplastic cord and plug.

model 151-CA
Lamp changer

model 3006
Vaporproof

model 5500-SRG
Grounded, no outlet
closed end cage

model 7000-SR
Reflector and Switch

model 650-M
Rubber hook handle

all are McGILL® quality

Send for the new McGill catalog No. 49-A describing the complete line of McGill Lamp Guards, Sockets and Switches.

McGILL®
electrical specialties

McGILL MANUFACTURING COMPANY, INC. **450 N. Campbell St., Valparaiso, Indiana**

"Thank You, Mr. Mullen"

An inquiry came across our desk recently for the names of distributors of Manson tape in Minneapolis. What snared our attention was the closing line in the note, "This is the 'best tape' that we have ever used, and we would like to obtain more." The writer, Mr. W. H. Mullen of the Bernard L. Dalsin Company of Minneapolis,

you can be assured, was answered promptly.

The Dalsin Company is not a big user of tape, they required only several rolls—but they did like it and took pains to get a new supply. This, we are certain, is the best testimonial to a good product.

Tape users everywhere have found that Manson tape is definitely a superior product. It is unequalled in true adhesiveness, and will retain this quality over extremely long periods. It is a true friction tape made of a closely woven cotton fabric into which has been frictioned only new, naturally tacky rubber compounded with the best chemical ingredients.

Okolite, Okoprene and Manson tapes make splices that will be tight and waterproof far longer than ordinary tapes, and consequently reduce maintenance costs. It's "spliced for life" when you use Okonite premium quality tapes.

Write for a set of instruction sheets EC - 5678; they will help solve your splicing problems.

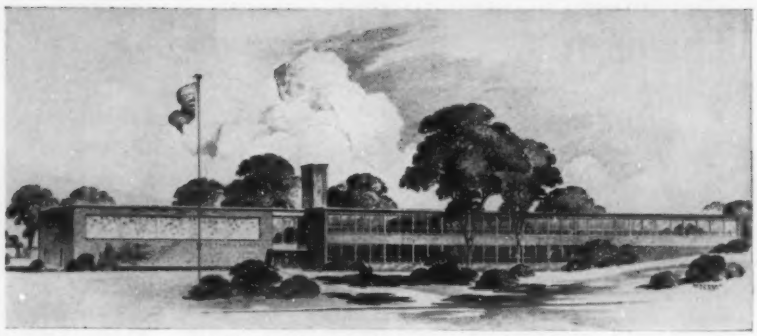
...when you splice with:

AVAILABLE THROUGH AUTHORIZED DISTRIBUTORS ONLY

2042

Made by
THE OKONITE COMPANY
PASSAIC NEW JERSEY
SINCE 1878

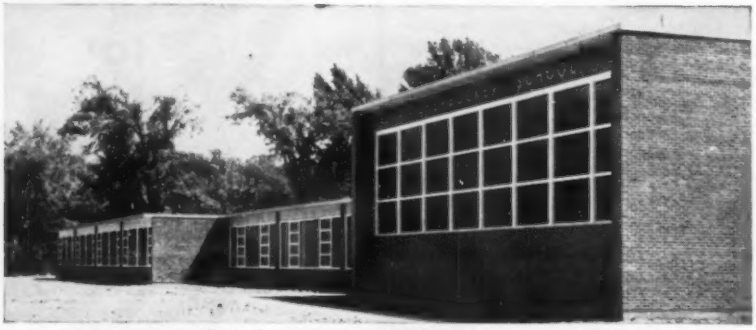
SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS



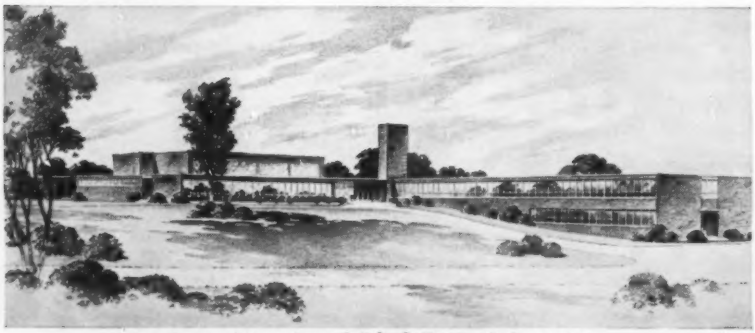
Holy Family School, Watertown, N. Y.

Gansevoort School, Rome, N. Y.

REPUBLIC "INCH-MARKING"



Knickerbocker Elementary School, Watertown, N. Y.

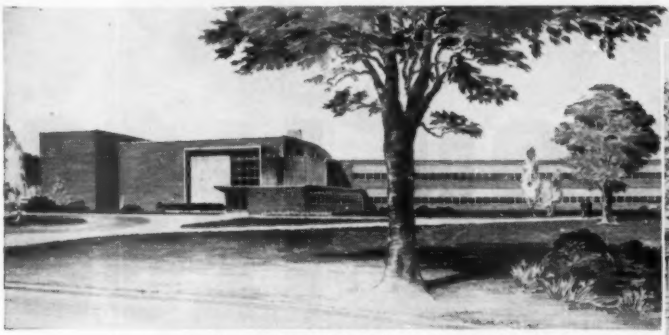


Beaver River Central School, Beaver Falls, N. Y.

Norwood-Norfolk Junior-Senior School, Watertown, N. Y.

Architect, all schools and housing project: Sargent, Webster, Crenshaw & Folley, Syracuse, N. Y.

Electrical Contractors, housing project and all schools except Norwood-Norfolk Junior-Senior High: Barber Electric Co., Inc., Watertown, N. Y.; Norwood-Norfolk Junior-Senior High School: Shelly Electric, Inc., Potsdam, N. Y.



Canton Junior-Senior High School, Canton, N. Y.

PAYS OFF

in Schools and Housing Project

Contractors around Watertown, N. Y., have been using a lot of Republic E.M.T. They find it goes in easier. So do their electricians.

Exclusive "Inch-Marked" lengths are easier to cut accurately. You measure the distance, not the tubing. Using the ELECTRUNITE Calibrated Bender, journeymen can make smooth, accurate bends.

There are no threads to cut. Connectors and couplings go over the tube to make tight joints, without turning the whole raceway or cutting away the galvanizing.

Wire-pulling is easier, too, up to 30 per cent. The reason is the exclusive inside-knurling in Republic E.M.T.

Add up all these advantages, and you'll see why so many contractors are using more and more Republic "Inch-Marked" Electrical Metallic Tubing. Use it on your next job.

REPUBLIC STEEL CORPORATION
Steel and Tubes Division
212 E. 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N. Y.

REPUBLIC STEEL

REPUBLIC ELECTRUNITE E.M.T.

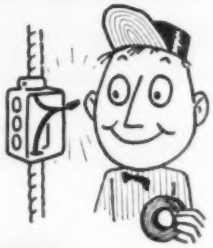
"INCH-MARKED" THE MARK OF QUALITY

"SCOTCH" 33

Now available in ¾ in. x 66 ft. "Economy Size" Rolls packed individually in easy-opening flare-edge cans, and in ¾ in. x 20 ft. "Job Size" Rolls packed 12 to a screw-top fibre container.

COSTS YOU LESS

One "Job Size" Roll of "Scotch" No. 33 Plastic Electrical Tape will insulate 40 splices at less than 1¢ a splice! Conventional insulating materials cost over *twice as much*. And "Scotch" 33 gives longer-lasting, more compact, neater results. Workmen like the way "Scotch" 33 sticks tight, stretches over contours. Plastic backing resists acids, oils, alkalies and moisture, too.



PER SPLICE!

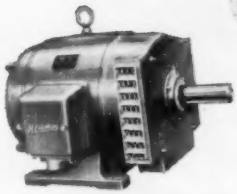
Buy it by the carton (144 rolls)—and see for yourself why "Scotch" 33 costs you *less* per splice. Order from your supplier today!

SCOTCH BRAND
Electrical Tape
No. 33
UL

3M COMPANY

The term "Scotch" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining and Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

An explanation by a world famous motor manufacturer of a price policy which offers savings up to 40% to American buyers



Motor-making has been our exclusive business for 18 years. Since 1935 we've sold approximately two million British-built motors in 62 countries. Right now we're making and selling an even greater volume.

When a firm like ours decides to bring its full line of motors into the American market, it's a big move. First, we had to be certain that we could offer something extra, for modern competitive marketing does not respond to reputation, quality and character alone. Clearly, we had to be dramatic. And fortunately we can afford to be. **We are offering the full line of world-famous NEWMAN motors at savings up to 40%.**

We can do this for two reasons: Economics favor us by keeping down our cost of manufacture; the largest motor production in our history has given us a further cost margin.

We are offering with the lowest prices an unconditional guarantee on all types and sizes of Newman motors, and any motor will be sent free for examination and testing.

Obviously we are trying to meet American industry on its own terms. Our motors, of squirrel cage totally enclosed fan cooled design and drip-proof wound rotor types to 230 horse-power, are available for immediate delivery from stock. And a nation-wide sales and service organization has been established. All motors are of unsurpassed quality and conform to N.E.M.A. standards. But you can compare these values yourself by writing for more information today.

A. Newman, *President*

Newman

NEWMAN INDUSTRIES (AMERICA) INC.
43 BROAD STREET
NEW YORK 4, NEW YORK

Newman Industries (America) Inc.
43 Broad Street, New York 4, New York

Please send me a catalog and price list of the full line of NEWMAN MOTORS now available in the United States at savings up to 40%

Attention of .....

Company Name .....

Address .....

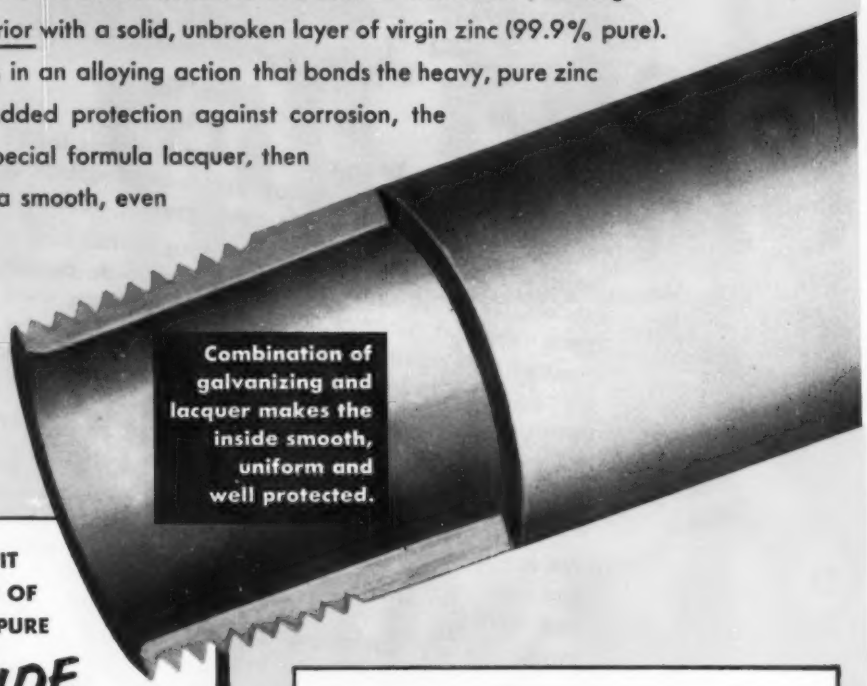
City ..... State .....

Here are the facts about Triangle's Hot-

Triangle Hot-Dip Galvanized Rigid Steel Conduit is produced from choice sections of the highest grade ingots. This insures a perfect base for proper bonding of the zinc. Every length is thoroughly scoured and pickled in acid, leaving the pipe perfectly clean before the application of the protective zinc coating.

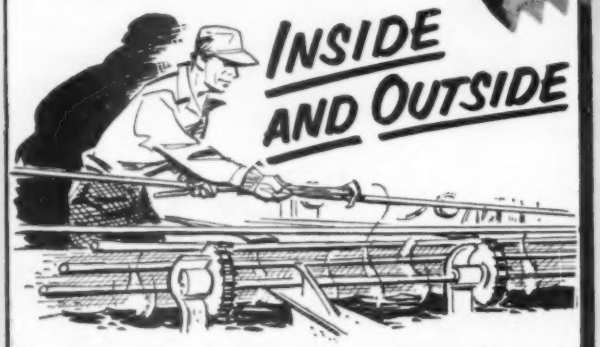
When perfectly clean, the conduit is immersed in a bath of molten zinc, coating the *interior* as well as the exterior with a solid, unbroken layer of virgin zinc (99.9% pure). The hot-dip process results in an alloying action that bonds the heavy, pure zinc coating to the pipe. As added protection against corrosion, the conduit is submerged in special formula lacquer, then baked, giving the conduit a smooth, even finish.

Conforms to Federal Spec. WWC-581b (Galvanized)



Combination of galvanizing and lacquer makes the inside smooth, uniform and well protected.

EVERY LENGTH OF CONDUIT IS IMMERSED IN A BATH OF MOLTEN ZINC — 99.9% PURE



INSIDE AND OUTSIDE

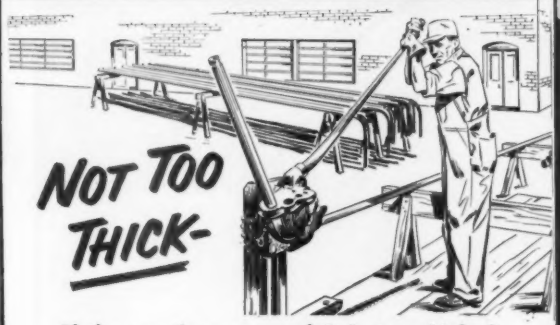
Every square inch of the conduit — inside and outside — is thoroughly and uniformly coated with pure zinc. Remember, because of condensation, the inside of conduit is just as subject to corrosion as the outside. That's why it's important to specify Triangle Conduit — protected inside and outside.

HOT-DIP GALVANIZING IS UNIFORM NOT TOO THIN-

Coatings that are too thin in even one spot, are likely to develop tiny pin-point holes through which corrosion can creep. There is no possibility of thin spots in zinc applied by the Triangle hot-dip galvanizing method. The thickness of the zinc coating is uniform — *exactly* the same from one end to the other. Hot-dip galvanized coating is two or three times as thick as other coatings.

Dip Galvanized Conduit.

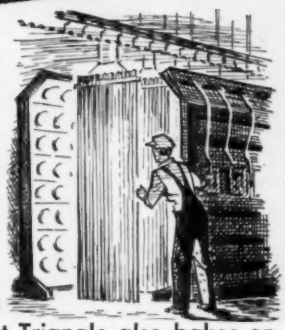
NOT TOO THICK-



If the coating on conduit is too thick, it is subject to cracking and flaking when being bent. Careful controls keep the coating of Triangle Conduit at just the *right* thickness — always.

Never too thick — never too thin.

AND AN EXTRA BONUS!



A clear lacquer is applied and baked on the conduit. Not only does Triangle apply the best protective coating (molten zinc) but Triangle also bakes on an additional transparent lacquer of special formula. The application of this baked-on coating insures a permanently smooth interior (for easy pulling) and also provides additional protection against rust or corrosion. It also protects the conduit during shipment.

TRIANGLE CONDUIT is Hot-Dip Galvanized—

and Triangle's hot-dip galvanizing has never been surpassed

TRIANGLE CONDUIT & CABLE CO., INC. New Brunswick, N. J.

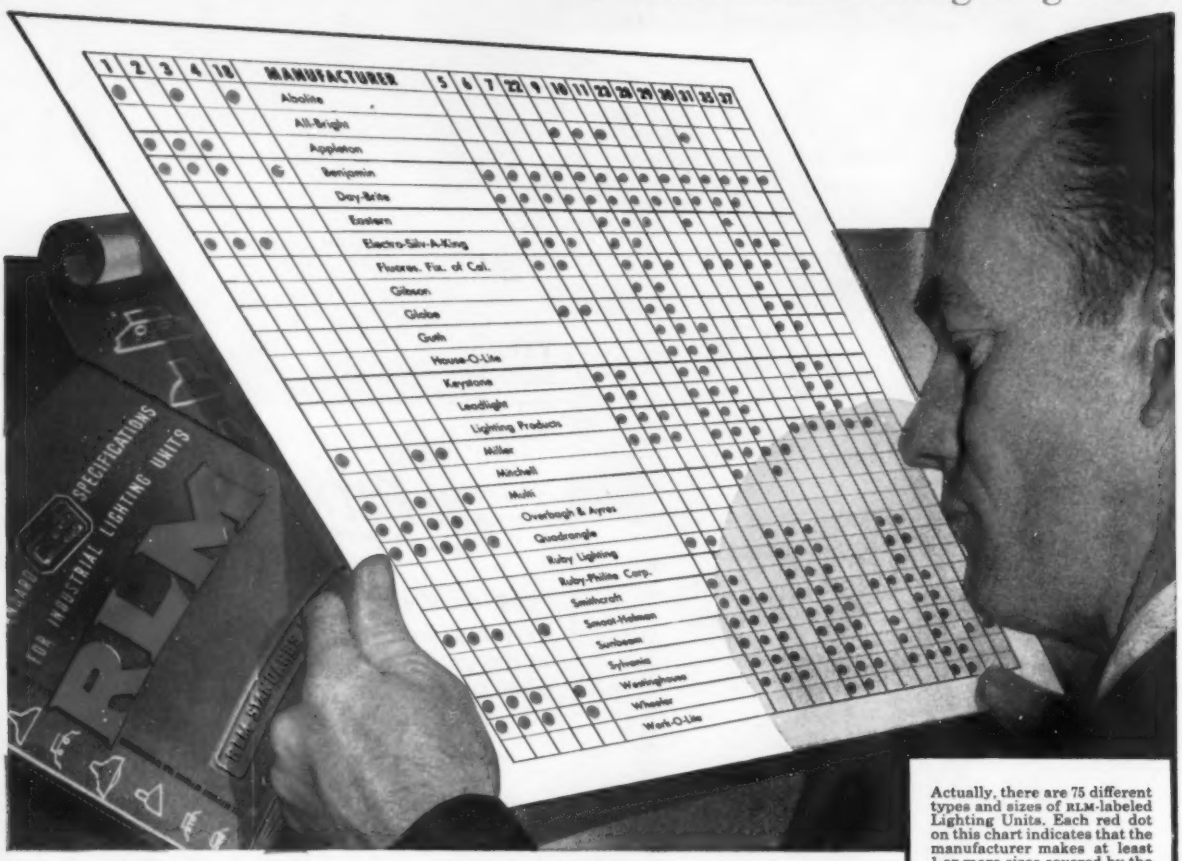
Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

Plants—New Brunswick, N. J.: Wire and Cable Plant, Rod Mill, Brass and Copper Tube Mill, Plastic Pipe Plant. Moundsville, W. Va.: Conduit Plant.

"It MUST Be Right!"

Here are your answers to 2 IMPORTANT QUESTIONS about Industrial Lighting Units



Actually, there are 75 different types and sizes of RLM-labeled Lighting Units. Each red dot on this chart indicates that the manufacturer makes at least 1 or more sizes covered by the particular RLM Specification.

Key to Spec. Nos.:

INCANDESCENT UNITS:

1. Dome (100-1000w)
2. Deep Bowl (100-1000w)
3. Sym. Angle (100-1000w)
4. High Bay (500, 1000w) Porcelain Enameled
18. Glassteel Diffuser (200-1000w)
40. High Bay Aluminum (500, 1000w)

FLUORESCENT UNITS:

Closed-End Reflectors:

5. 2-40w lamps, 48"
6. 3-40w lamps, 48"
7. 2-85w lamps, 60"
22. 2-40w w/shield, 48"

Open-End Reflectors:

9. 2-40w lamps, 48"
10. 3-40w lamps, 48"
11. 2-85w lamps, 60"
23. 2-40w w/shield, 48"
28. 2-58w, 72"
29. 3-58w, 72"
30. 2-75w, 96"
31. 3-75w, 96"

Semi-Direct Units:

35. 2-40w, 48"
36. 2-58w, 72"
37. 2-75w, 96"

Chart as of Jan. 1, 1954

1 WHY are RLM Specifications Important to me?

ANSWER: RLM Specifications furnish you with basic, nationally-accepted minimum standards of efficiency, design, performance and quality in industrial lighting equipment. This latest-edition 52-page RLM Specifications Book puts all 21 RLM Specifications at your fingertips, complete with coefficient of utilization tables and candlepower distribution curves. In addition, there are four pages of reasons why RLM Specifications are important to everyone who buys, sells or specifies industrial lighting equipment. Send for your COMPLIMENTARY COPY of the RLM Specifications Book . . . there is no obligation!

2 WHO makes RLM-Labeled Units I want to Specify?

ANSWER: As shown by this chart, which is also included with the RLM Specifications Book, there are 29 different manufacturers who make RLM-labeled lighting equipment. Each RLM Unit must conform to the minimum performance and quality standards required by RLM Specifications. However, every manufacturer is free to incorporate his own special features, construction refinements and operating advancements — such as sockets, control equipment, wiring, etc. Send for your FREE RLM Book for more details. RLM Standards Institute, Suite 819, 326 West Madison Street, Chicago 6, Illinois.

RLM STANDARDS INSTITUTE
INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

LOOK FOR MANUFACTURER'S NAME HERE
COMPLIANCE WITH SPECIFICATIONS AND INSPECTION BY INSURED RLM SERVICE
ELECTRICAL TESTING LABORATORIES, INC

R568

GET LOWEST INSTALLED COSTS . . . EVERY TIME . . . WITH

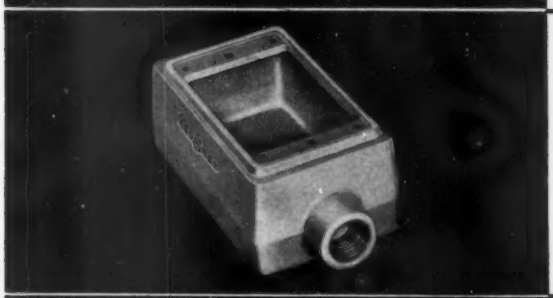
GEDNEY CONDUIT BODIES

MALLEABLE IRON—HOT DIP GALVANIZED

YOU CAN'T HELP but cut installation costs with Gedney Conduit Bodies. Every one of them is accurately machined and threaded . . . smooth finished . . . made of unbreakable malleable iron . . . inspected for complete perfection. On top of that, they're special hot dip galvanized to assure absolutely top life on the job . . . and they come in all types and sizes from ½" to 4".

AMONG GEDNEY'S COMPLETE LINE ARE:

TYPE LB—Threaded—for heavy wall rigid conduit. Used with Gedney entrance fittings, straps, clamp backs, etc., you get an *entire* conduit system with hot dip galvanized finish.



TYPE FS—Threaded—shallow bodies for heavy wall rigid conduit. Only Gedney gives you hot dip galvanized as standard finish . . . no corrosive deposits on threads to slow down work and hike costs.

NO MATTER WHAT your requirements may be, there's always the right Gedney body and fitting for the job. To cut installation time and costs and assure long-run dependability, specify Gedney, always.

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY

GEDNEY

RKO BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

Easier wire pulling

WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER

Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown

QUALITY V YOUNGSTOWN SERVICE

●Smooth bends reduce wire pulling time, especially where workers are cramped for room. Buckeye always bends easily and smoothly. Interior surfaces are mirror-smooth, never chip or break under bending or shock. That's why so many contractors specify Youngstown rigid steel conduit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

FINANCIAL AID TO HIGHER EDUCATION

Our Colleges and Universities Face Grave Financial Problems

For the past decade the nation's colleges and universities have been caught in a destructive financial squeeze. It is particularly destructive for the independent, privately endowed institutions. Unless extraordinary measures are taken to relieve this squeeze, it promises to become progressively worse. To let it do that is to court a national disaster.

This is the first of two editorials devoted to the financial plight of our colleges and universities. This first editorial deals with the character of the problem, present and potential. The second will indicate some things that need to be done about it, and particularly what American business might do.

Enrollment Soars, Income Lags

In broad outline, the financial problem that afflicts our colleges and universities is simple. The demand for their services has increased rapidly, and promises to keep on increasing even more rapidly. At the same time, their financial capacity to provide these services has lagged behind, primarily because of price inflation.

Between 1940 and 1950, college and university enrollment increased from approximately 1⅓ million to 2⅓ million—about 75 per cent. Over the same period, the educational income of these institutions, measured in terms of its actual purchasing power, increased only about 64 per cent. Thus, at the end of the decade, our colleges and universities as a group had, on the average, about 6 per cent less to spend per student than they had at the beginning. Meanwhile, the rapid advance of science and technology had made a good college or university course a much more expensive operation than it was in 1940. Since 1950, the latest date for which comprehensive figures are available, the financial squeeze on our colleges and universities has intensified, largely because of another wave of price inflation touched off by the Korean War.

Among the colleges and universities, the independent, privately endowed institutions are particularly hard pressed. In terms of actual purchasing power, the independent liberal arts colleges are now spending at least 20 per cent less per student than they spent in 1940. Public institutions of higher learning, supported out of tax revenues, have managed to increase slightly their expenditure per student. Otherwise, the financial squeeze on higher education as a whole would be even more severe.

Why Independent Colleges Are Hit Hardest

The principal reason why the independent colleges and universities are so hard up is the shrinkage in their income from endowments. These endowments, created in other days by gifts of generous benefactors to help pay the expenses of higher education, have been hit hard from two directions. During the war and post-war years, the tax collector took so large a part of the incomes and estates of wealthy people that this source of endowments has been greatly reduced. Over the same period price inflation cut in half the purchasing power of the income derived from existing endowments. In 1940 income from endowments provided 26 per cent of the total income of the independent colleges and universities. By 1950 it provided only 14 per cent. The figure is still lower today.

The financial plight of the independent colleges and universities is directly reflected in the salary status of their teaching staffs. In mid-1952 a national survey showed that, after adjustment for the increased cost of living, the salaries of those holding full professorial rank in these institutions were 12 per cent lower than they were in 1941-42. Junior teachers, with the rank of instructor, fared somewhat better. In terms of actual purchasing power, their salaries declined only 2 per cent over the 12-year period, largely because there is more direct competition for their services from industry. Over the same period, the real wages of industrial workers increased 55 per cent.

Time Will Not Provide a Cure

The plight of the colleges and universities, which is shared in some degree by all parts of our educational system, is not one that can be left to time for a cure. On the contrary, the financial problems of our institutions of higher learning will be intensified in the years ahead by the pressure of rapidly increasing enrollments. Present prospects indicate that during the next decade college and university enrollment will increase by about one-third, or from 2⅓ million to over 3 million. The problem of increased enrollments will become particularly acute toward the end of this decade when the babies born during the great surge of population in World War II are ready to enter college.

Such an increase in population as that now in prospect can be a tremendous asset to the nation. It is still a truth, even though it is worn a bit thin by frequent repetition at commencement exercises, that a nation has no resource more valuable than the education of its people. And the better the education, the more valuable the asset.

But to realize this, our colleges and universities must have the financial strength to handle the increased enrollments that face them in the years ahead. This means that we must relieve our independent colleges and universities, in particular, from the financial squeeze in which they are now caught and make them full partners in the economic well-being of the nation. Some of the means by which American business might help achieve this will be discussed in a second editorial.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

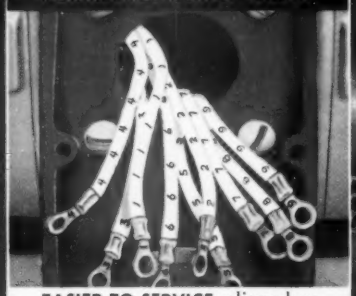
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

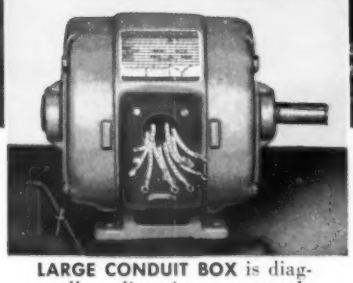
TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

PERMA-NUMBERED LEADS



EASIER TO SERVICE, clipped or taped terminals always can be read. You save hooking-up time.

EASY ACCESS CONDUIT BOX



LARGE CONDUIT BOX is diagonally split—gives you ample knuckle room for easier wiring.

60% MORE PROTECTION

MORE FULLY PROTECTED motor achieved through redesign of cast iron frame and end shields.

LONGER MOTOR LIFE

NEW BEARING SYSTEM means the G-E motor runs longer without relubrication than any other.

Now, easier installation, less maintenance...

G.E.'s new TRI 55 CLAD motor—you can install it and forget it!

REG. U.S. PAT. OFF.

The all-new General Electric Tri/Clad '55' motor is specially engineered to reduce your installation costs . . . and run longer, without attention, than ordinary motors. This new motor gives you 60% more physical protection plus longer electrical life. In addition, a bearing system designed to use the most modern greases means you will not have to regrease the Tri/Clad '55' for years.

You save with the new Tri/Clad '55' because wiring is easier and faster. The large, diagonally split conduit box gives you plenty of knuckle room. Leads are perma-numbered . . . you can always identify them instantly.

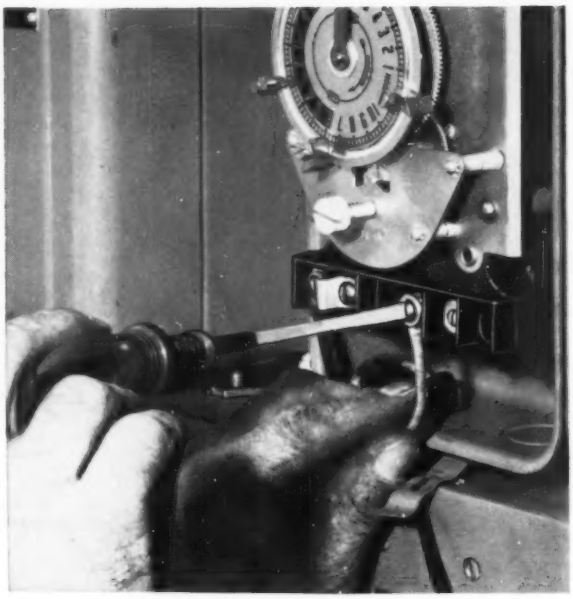
The new Tri/Clad '55' also brings you important handling, storing and installing economies. Better use of space within the frame means a 30% reduction in size and weight in some ratings. Yet active materials (magnetic steel and copper) are not sacrificed.

General Electric Tri/Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6013—Dripproof motors, GEA-6012—Enclosed motors, GEA-6027—Gear-motors. General Electric Company, Section 648-7, Schenectady 5, N. Y.

Progress is our most important product

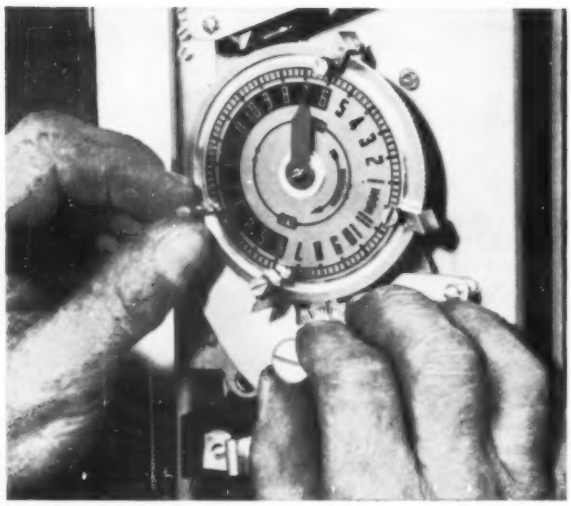
GENERAL ELECTRIC

1 ATTACH SWITCH TO MOUNTING SURFACE: Hang by means of lug at top, secure with two screws through holes in case—takes only a few seconds; rugged, drawn-steel housing makes T-27 suitable for any outdoor-indoor installation.



2 WIRE: Connect to clearly marked, readily accessible terminal blocks at front of T-27—requires little time. A minimum of circuit connections, maximum hand room below terminals and five double knockouts facilitate quick wiring.

Reduce Installation Time With Dependable General Electric Time Switches



3 SET DIAL: Adjust to correct time, position trippers for desired on-off period—easy as setting a wrist watch. With omitting device, T-27 skips days; with astronomic dial, follows dusk-dawn schedule; performs 10 on-off operations daily.

3 Simple Steps Make Installation of General Electric's T-27 Time Switch Extremely Fast and Easy

ONCE INSTALLED and set, the T-27 will give years of reliable, dependable on-off control.

ACCURATE TIMEKEEPING is assured by a self-starting, self-regulating, permanently lubricated Telechron* motor, sealed to keep out dirt and dust.

RUGGED CONSTRUCTION insures little maintenance. All parts of T-27 switch mechanism subject to heavy duty are made of copper-nickel-plated steel, and switch blades are of beryllium copper for the best combination of mechanical and electrical characteristics.

FOR MORE INFORMATION on T-27, contact your nearest authorized G-E Time Switch distributor. Ask for G-E Time Switches at his store; and write for Bulletins GEA-5965 and GEC-535C to Section 603-168, General Electric Company, Schenectady 5, N. Y.

*Reg. Trade-mark of General Electric Co.

GENERAL ELECTRIC

New G-E Series and Lead-lag Ballasts ... Compare and Choose for Yourself

Here is a comparison of G.E.'s two new ballasts for operation of 96T12 lamps at 425 ma. Catalog No. 89G496 is the newly designed series ballast—smaller, lighter, quieter. Catalog No. 89G490 is the similarly redesigned lead-lag ballast.

BOTH BALLASTS ARE CBM CERTIFIED and contain that full measure of extra quality which G-E engineers into every ballast, but the series ballast, by its inherent design characteristics, gives you more value for your dollar. However, if you prefer lead-lag instead of series, the new lead-lag ballast has been designed to give you the most value compared to other lead-lag ballasts.

THE SERIES BALLAST gives you equivalent performance, in accordance with lamp specifications, and offers a substantial savings in cost and size. At right is a comparison of these two General Electric ballasts. The major areas of difference are printed in bold face. You can see that the series is less expensive, uses less line current, has less wattage loss, weighs less, has a quieter sound rating, is smaller.

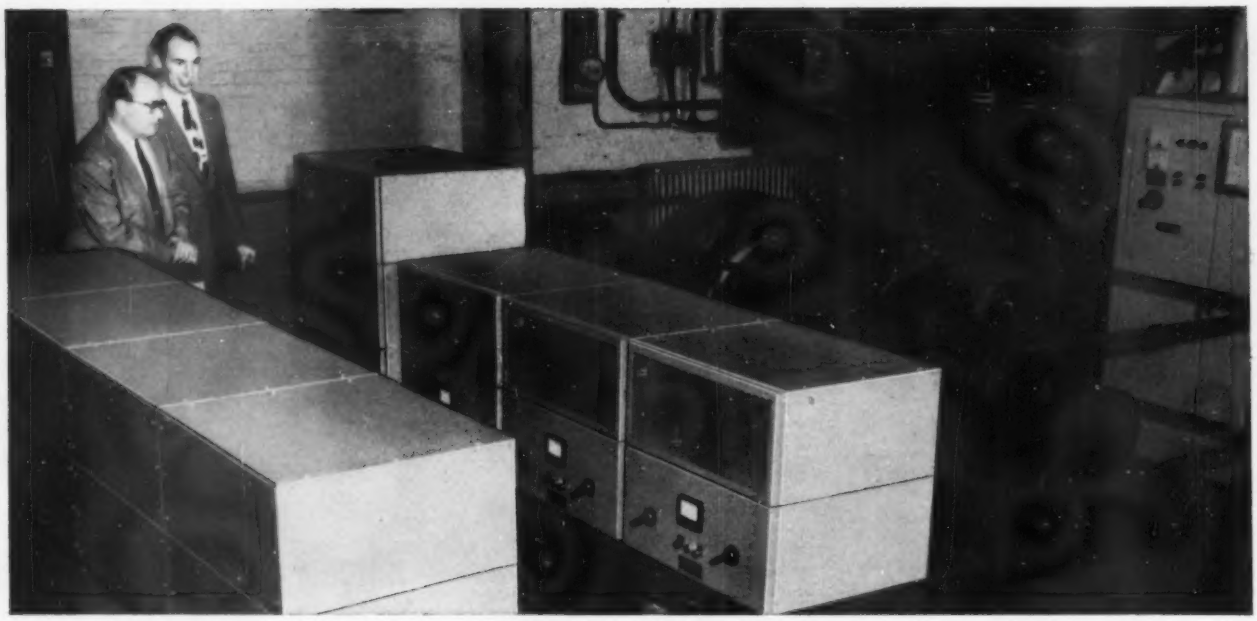
Compare and choose for yourself.

For further information on either series or lead-lag ballasts, write to Section 401-6, General Electric Co., Schenectady 5, New York.

SERIES 89G496		LEAD-LAG 89G490
73	Nominal lamp watts	73
110–125	Circuit voltage	110–125
60	Frequency	60
1.55	**Line Current in Amps**	**1.60**
.425	Lamp Current in Amps	.425
28	**Watts Loss**	**36**
90%	Min line power factor	90%
$10.15	**List Price Each**	**$12.60**
6	No. Units per Package	6
65	**Approximate Ship weight**	**74**
D	**Sound Rating**	**E**
11¾	**Over-all length**	**14⅜**
11 9/64	**Mounting Length**	**13¾**

Progress is our most important product

GENERAL ELECTRIC



SUPPLYING D-C POWER for an oxygen-hydrogen plant is this installation of General Electric germanium rectifier power conversion units. These individual units are rated 25 kw, and are combined in series-parallel totalling 150-kw output.

General Electric Announces Germanium

New 25-kw d-c power supply units operate at approximately 94 per cent efficiency between half and full rated load.

General Electric germanium rectifier power conversion units are an important new source of d-c power for industrial plants. In a number of applications they have important advantages over other types of conversion equipment, either rotating or static.

WHAT ARE THESE UNITS?

G-E germanium rectifier power conversion units are packaged equipments which economically convert alternating current to direct current near where it is to be used. They consist of a transformer, germanium rectifiers, and control equipment mounted in a sturdy metal casing. A small cooling fan is the only moving part.

WHERE ARE THEY USED?

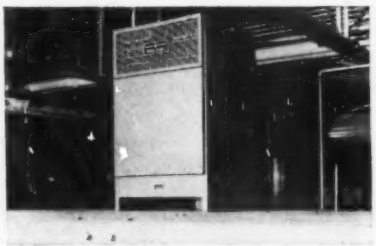
Typical applications for germanium rectifier power conversion units are supplying power for constant speed d-c motors, or excitation current for synchronous motors. They can be used to supply direct current for magnetic chucks, brakes, and clutches, or for testing d-c equipment. They are also especially suited to electrochemical processes.

WHAT ARE THEIR ADVANTAGES?

The 94 per cent efficiency of these germanium power conversion units is their outstanding advantage. As the chart shows, they operate with this exceptional efficiency even at half load. No other type of recti-

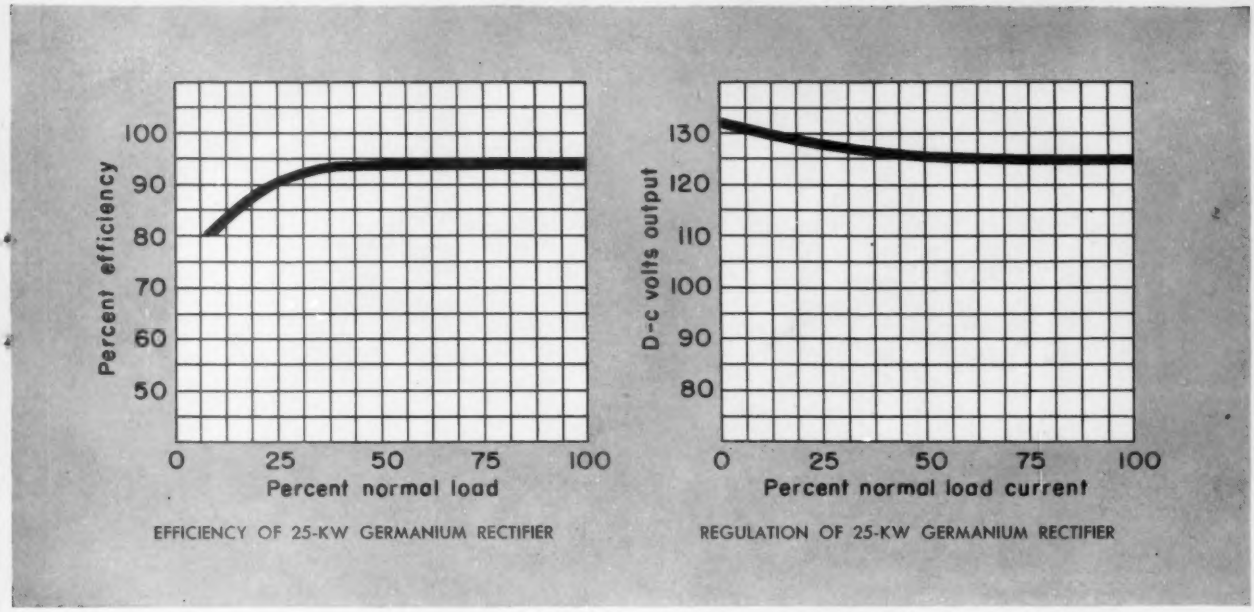
Additional General Electric Rectifier Products to Meet Other D-C Power Requirements

SELENIUM RECTIFIER POWER SUPPLIES
Ratings 0.75 to 25 kw fit most d-c needs. With dynamic braking panel including absorbing resistor, units can be used with hoists or other regenerative loads.



ELECTROPLATING POWER SUPPLIES
General Electric's line of plating power supplies included models for laboratories and barrel plating as well as equipment with manual or automatic regulation.

INDUSTRIAL TRUCK BATTERY CHARGERS
Reliable, easy-to-operate metallic rectifier battery chargers are available for all makes and models of electric driver-lead or driver-ride industrial trucks.



EFFICIENCY OF 25-KW GERMANIUM RECTIFIER

REGULATION OF 25-KW GERMANIUM RECTIFIER

CONVERSION EFFICIENCY of new 25-kw germanium conversion units runs at about 94 per cent from half to full rated load.

VOLTAGE REGULATION of equipment is excellent. Output voltage drops only about 6 per cent between no load and full load.

Rectifier Power Conversion Equipment

fication equipment of comparable efficiency has this characteristic at this voltage and power level.

The excellent regulation of these units is shown on the chart, also. Output voltage drops only about six per cent between no load and full load. The minimum power factor of these units is 95 per cent.

Installation costs are low since no special foundations or mounting platforms are required. Units can be placed on any flat surface and after simple electrical connections have been made, they are ready to operate.

Maintenance costs are practically zero because nothing moves except the cooling fan. Germanium rectifiers do not deteriorate with use.

RATINGS

Standard germanium rectifier power conversion units are presently rated 65/125 volts, 400/200 amperes d-c. However, units may be combined in series and/or parallel where higher ratings are required.

For complete information on this newest source of d-c power for industry, contact your nearest G-E Apparatus Sales Office, or fill in the coupon for bulletin GEA-5825, Germanium Rectifier Power Conversion Units. *General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

*Registered trade-mark of General Electric Co.

GENERAL-PURPOSE BATTERY CHARGERS

For charging stand-by, control, signal and engine-starting batteries, General Electric makes a complete line of Tungar* and selenium general-purpose chargers.

Section A462-9, General Electric Company
Schenectady 5, N. Y.

Please send me the following bulletins:

☐ for reference ☐ planning an immediate project

☐ GEA-5825 Germanium Rectifier Power Conversion Units
☐ GEA-5658 Selenium Rectifier Power Conversion Units
☐ GEC-970 Electroplating Power Supplies
☐ GEA-5292 Automatic Chargers for Driver-ride Trucks
☐ GEC-826 General-purpose Battery Chargers

Name .....

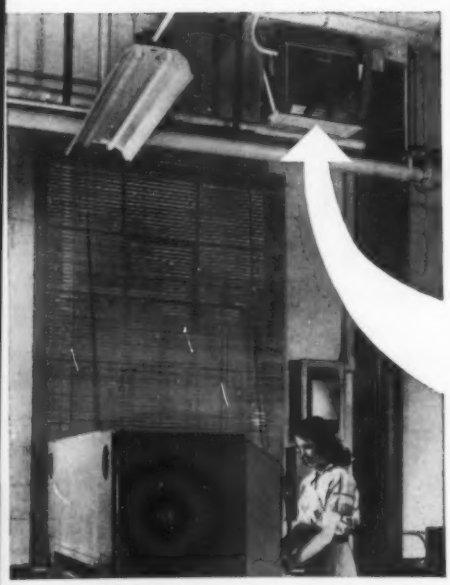
Company .....

Street .....

City ..... State .....

EASY INSTALLATION and easy handling are features of G-E dry-type transformers. One being installed above is a Type M, rated .25 kva for indoor or outdoor use. Type D, rated 25 kva and up, is also available for indoor use only.

G-E dry-type transformers give you flexibility, economy, convenience



GREATER FLEXIBILITY of G-E dry-type transformers makes it possible to move them around the plant wherever they are needed and to install them in any out-of-the-way spot.

An easy way to add flexibility to your present power distribution system without changing your basic wiring system

The extreme flexibility of General Electric dry-type transformers is a great advantage in the modern plant. Machines are being moved around continually, and with dry-type transformers the proper operating voltage can be quickly obtained at the load from your established power system.

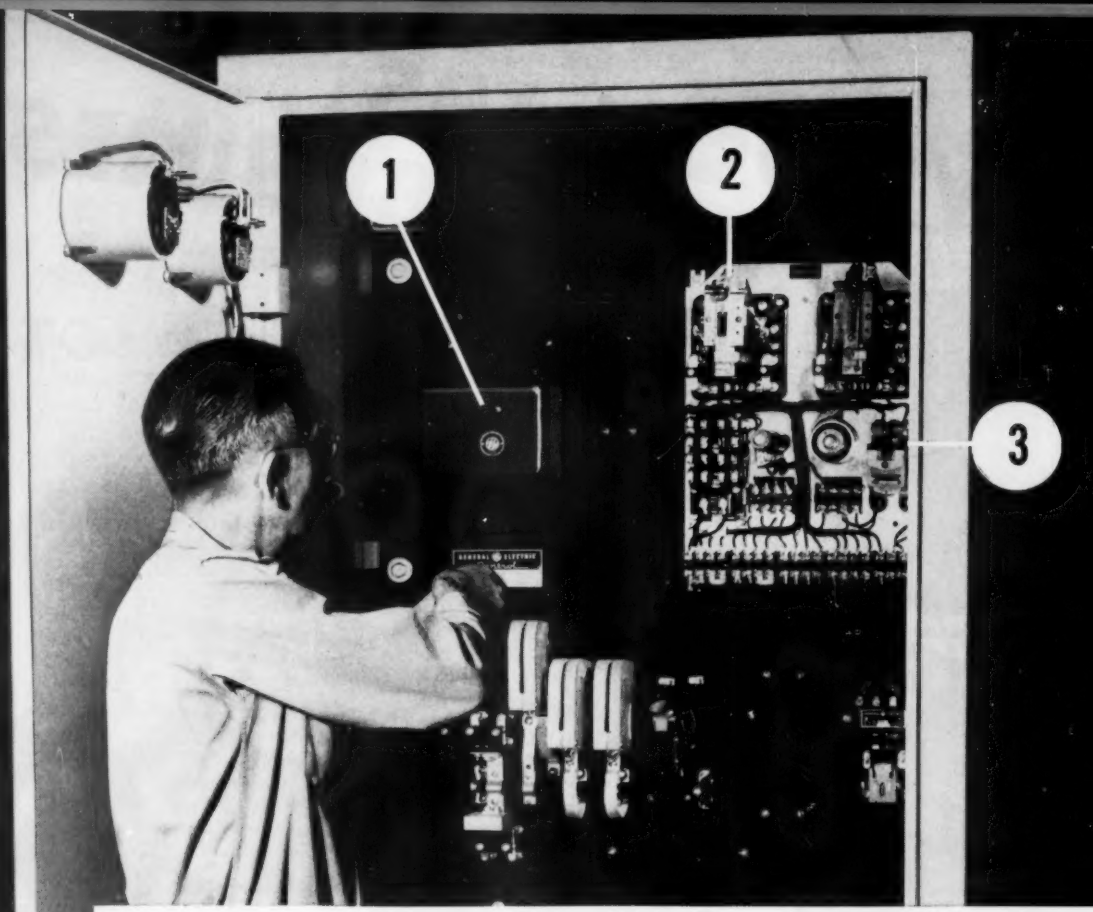
Economical—Here is a minor investment that pays off in major savings. By specifying and installing G-E dry types, you save in two ways: (1) Once installed, they require virtually no inspection or maintenance. (2) Adding dry-type transformers keeps your power system flexible to match new voltage requirements.

Convenient—G-E dry types offer a convenient method of stepping voltage down to the required level for portable tool operation.

Off-the-shelf delivery is available for most popular ratings. Whether you are stepping up, stepping down, boosting or bucking, there is a G-E dry-type transformer to meet your needs. For more information, contact your G-E distributor or write for Bulletin GED-2024, General Electric Co., Section 411-117, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC



Only G.E. Gives You These 3 Features in Standard Synchronous Motor Control at No Extra Cost

1. GRADUATED SQUIRREL-CAGE PROTECTION Relay protects motor during stall or subsynchronous operation. Protects squirrel-cage winding against overheating.

2. PRECISION ANGLE SWITCHING Field application relay takes fullest advantage of motor's synchronizing ability—applies field at correct speed and most favorable angle between rotor and stator poles.

3. LOAD ANGLE FIELD REMOVAL Fastest field removal available assures long motor life. Power-factor relay removes field within first half slip cycle out of synchronization.

• You get these and other big features in *standard* G-E synchronous motor control at no extra cost. Be sure to get complete details—contact your nearest G-E Apparatus Sales Office or use the convenient coupon to get our new 16-page descriptive bulletin.

Section F 780-3
General Electric Company
Schenectady, N. Y.

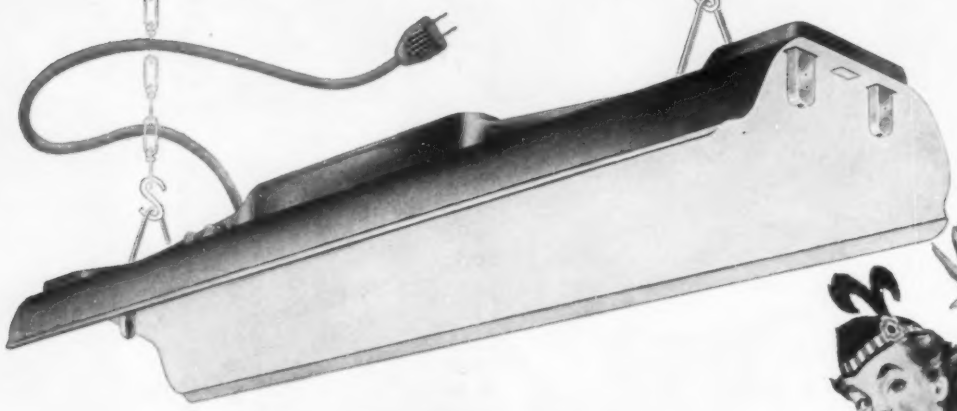
Please send me your new bulletin, GEA-5873 which gives complete information on G-E Synchronous Motor Control.

Name.....
Position.....
Company.....
Address.....
.....

GENERAL ELECTRIC

SAVE DOLLARS... BUILD BUSINESS

with this Sensational Fluorescent Fixture Offer!



ASK FOR SYLVANIA'S "CONTRACTOR THR-R-RIFTY PACK!"

Sylvania's famous HF Fixtures now packed with installation components ...at no extra cost!

During the past ten years, more than 1,500,000 Sylvania HF-100 fixtures have been installed in scores of important industries.

Now, by way of acknowledging both this important anniversary and this great record, we are offering the famous HF fixture series . . . HF-100, HF-150 and HF-235 . . . with 2 chain hangers, rubber-covered cord, and plug set, *at no additional cost!*

This special package, called the "Contractor Thrifty Pack," brings you all the components needed for easy installation . . . *at the same price you previously paid for the fixture alone.*

You'll find every plant, warehouse, and garage a live prospect for at least one of these fixtures. Be sure to push and you'll be sure to profit by Sylvania's "Contractor Thrifty Pack."

For full details call your regular Sylvania Distributor, or write to Dept. 4X-2405, Sylvania today.

SYLVANIA

Sylvania Electric Products Inc. **1740 Broadway, New York 19, N. Y.**

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

LIGHT FOR FREEDOM · POWER FOR PROGRESS

Cut Plant Power Costs

...increase machine efficiency

Want to save installation and operating costs? You can do both with an Allis-Chalmers dry-type transformer.

ALLIS-CHALMERS Dry-Type Transformers

10-kva dry-type transformer.

225-kva dry-type transformer.

Low Installation Cost. Allis-Chalmers dry-type transformers require no expensive vaults. They are safe and clean. They fit into industrial plant layouts — they are lightweight and easy to handle.

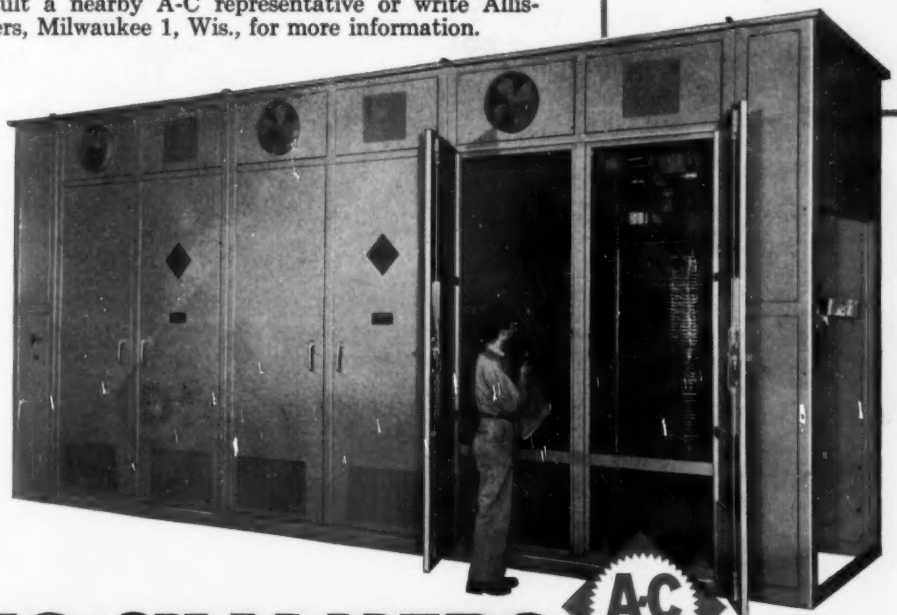
Low Operating Cost. Routine inspection is all the maintenance you need. There are no gauges to check, no liquids to filter.

Completely Enclosed Design is standard construction on small low voltage transformers. They are recommended for indoor or outdoor applications and operate well in dusty or lint filled atmosphere. Solderless connectors speed installation. Mount on wall or post. Ratings are single-phase sizes 10 kva and smaller; three-phase sizes 15 kva and smaller, 600 volts and below.

Open Ventilated Transformers are designed for indoor use. They are easy to hook up; need no special vault enclosures. They are cooled by natural or forced draft. Used as load center transformer or unit substation in the larger sizes, with high or low voltage switchgear. Ratings are single-phase sizes 15 kva and larger; three-phase sizes 30 kva and larger, 15 kv and below.

Consult a nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wis., for more information.

A-4267



This 10,000-kva dry-type transformer is one of a large number of units Allis-Chalmers is building for the Atomic Energy Commission.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

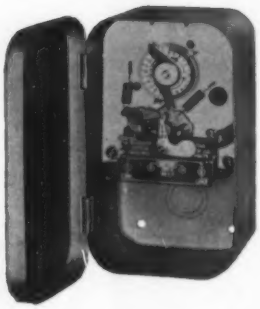
NOW... you can use genuine SANGAMO QUALITY Time Switches for all of your jobs!

At last you can use a really top quality time switch that will assure satisfactory performance on every installation—even those that call for the least expensive equipment. The new Sangamo Type B Time Switch, that costs only a fraction more than the very lowest priced time switch, puts Sangamo Quality within the reach of all. It's rated at 30 amperes, and will open an entirely new range of applications for single-pole single-throw time switches.

Get this sensational value at your electrical wholesaler's today—try the new low priced time switch that will wipe out the service call headache and the need for defective switch replacement.

STURDY ALL-STEEL CASE

The new Type B is enclosed in an attractive all-steel case with a hinged cover that can't be misplaced and a sealable hasp for protection against tampering. There is no glass window to break accidentally. Overall dimensions—7¼" high, 4¼" wide, and 3⅛" deep.



PLENTY OF WIRING ROOM

Type B is a cinch to install! Almost one half of the inside space available for speedy wiring, four convenient ½"—¾" multiple knockouts and a keyhole slot in the back permit neat, fast, labor-saving installation.

SANGAMO

SANGAMO ELECTRIC COMPANY

ST54-1

SPRINGFIELD, ILLINOIS

30 AMP. RATING
Single-Pole Single-Throw

EASY TO OPERATE
Setting dial is simple and the two "on" or two "off" trippers can be hand tripped without disturbing automatic operation.

DEAD FRONT SAFETY
The dead front insulating shield that eliminates exposed wiring and exposed contacts gives protection against accidental shocks.

WORKS BETTER
Sangamo-proved timing mechanism runs quietly and efficiently and requires no maintenance.

INSTALL IT AND FORGET IT!
The reliable Sangamo slow speed motor stops service calls, but it won't stop in coldest winter or hottest summer.

LASTS LONGER
NEMA Standard 30 ampere rating. Long life heavy silver contacts mean minimum arcing for maximum performance.

SANGAMO QUALITY at $13.50 list
Trade Discounts Apply

the NEW Sangamo Type B Time Switch has EVERYTHING YOU'VE BEEN WANTING in a low-priced switch!

Type B truly represents well-known Sangamo Time Switch Quality. It is powered by the same slow speed motor that powers Sangamo heavy-duty time switches. It is built with the same Sangamo precision that assures dependability, accuracy, and long lasting troublefree performance. And, it carries the same liberal 18 month guarantee that backs any other Sangamo Time Switch. Give yourself—and your customers—a break by using the Type B on all jobs where price must be considered.

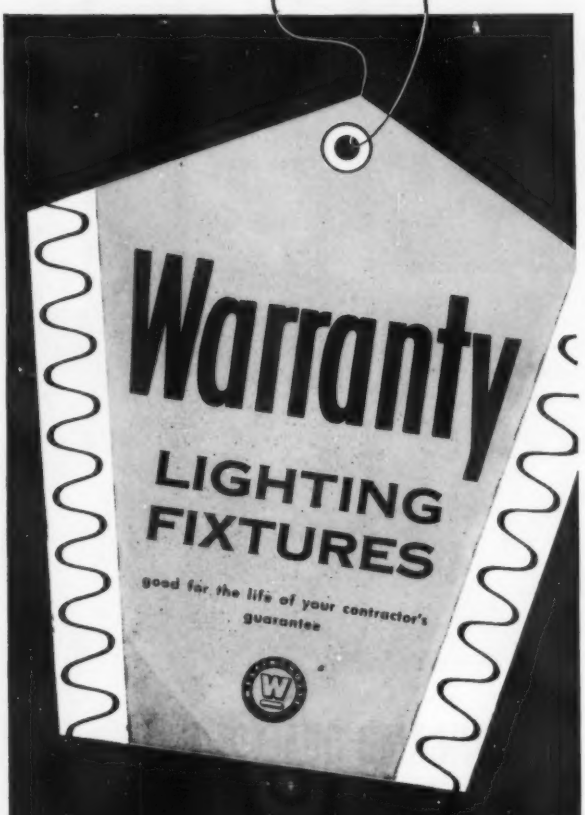
Use this unconditional lighting fixture warranty to promote business

This seal helps you promote new lighting business . . . and automatically opens the door to other electrical improvements. It has merchandising power: it advertises, demonstrates, proves and helps sell your own high standards of quality.

Good lighting helps build reputation. It's an electrical improvement the public *sees and talks about.* It takes just one outstanding lighting improvement in a business block, and others soon follow.

That's why you don't take chances. You guarantee your work—and we have no hesitation in backing you *all the way.* That's why the Westinghouse lighting fixture warranty is for the *exclusive use* of electrical contractors who guarantee their work. You name the terms —we'll back you up. J-04351

YOU CAN BE SURE... IF IT'S Westinghouse



Get This Merchandising Package; Today!

Get your personal copy of the Westinghouse warranty package. Warranty covers the entire line of commercial, industrial and floodlighting fixtures (lamps, starters and labor not included).

Westinghouse Electric Corporation
Lighting Division
Cleveland, Ohio

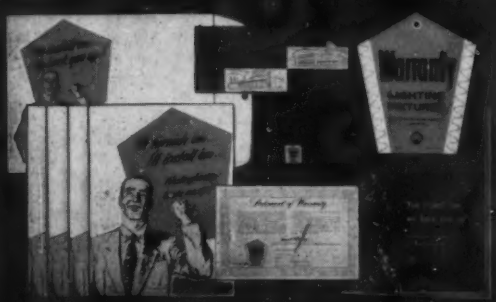
Please send my personal copy of warranty package.

Name_____

Company_____

Street_____

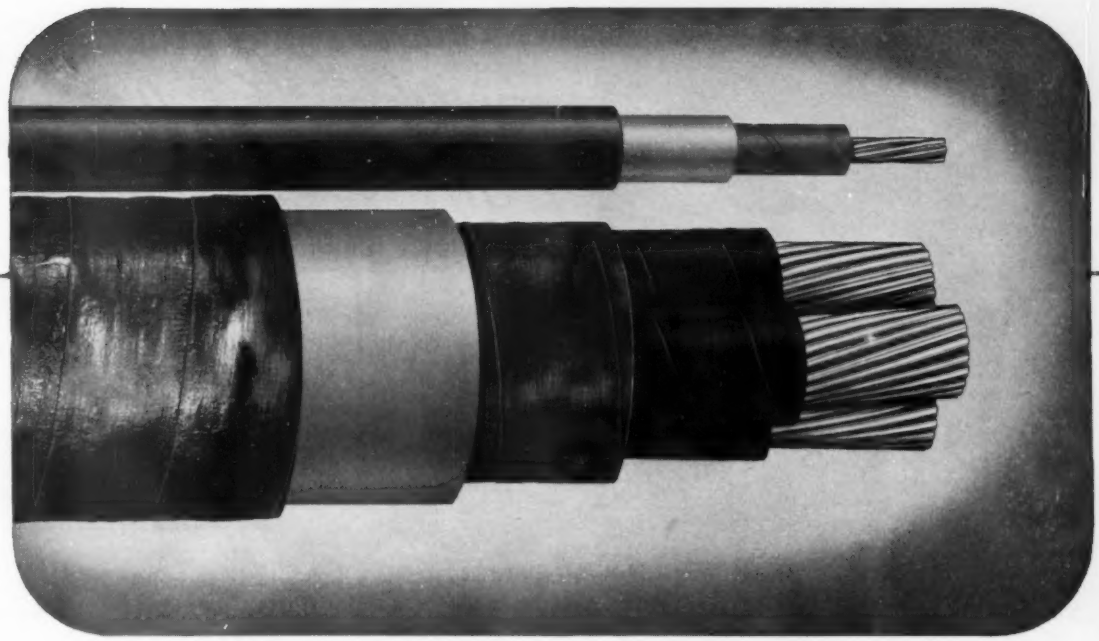
City_____ Zone____ State_____



Business-building ideas, personalized direct mail and practical installation tips on how to build sales, profit and prestige through lighting.

ROEBLING PROTECTIVE COVERINGS ON LEAD SHEATHED CABLE

for utilities, chemical plants and the petroleum industry



LEAD SHEATHED CABLES used in certain applications by public and private utilities, chemical plants and the petroleum industry are often impaired by electrolysis or chemical corrosion. But such corrosive action can be effectively reduced, and cable life extended, by using Roebling Paper Insulated and Varnished Cambric Cables with either of two outer protective coverings.

One of these coverings is an extruded thermoplastic sheath employing a special high-molecular weight polyethylene. The other is ROESHEATH, built up of neoprene and neoprene-filled fabric tapes and vulcanized directly over the lead sheath. Both coverings not only provide essential protection, but, in some cases, may permit the thickness of the lead sheath to be reduced.

For longer, more dependable cable life and worthwhile economy write for full information... and get our recommendations for solving any special problem.

John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

A subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

CF&I

JAR ROEBLING

Kirlin SYSTEM BUILT-IN Lighting

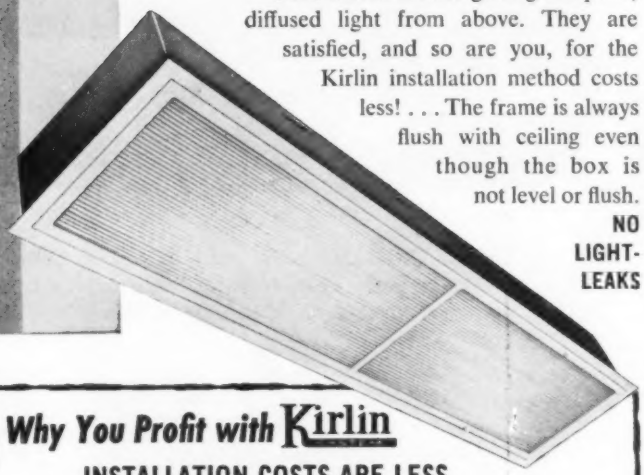
Nothing dangles from Ceiling

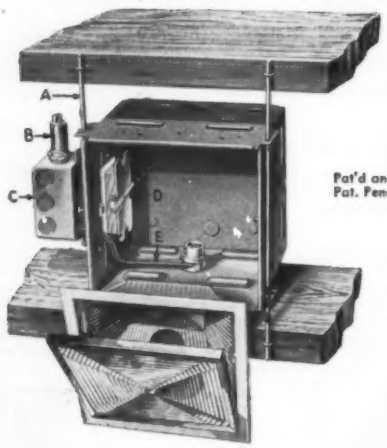
WONDERFUL!... How Do They Get So Much Light?

You work for more than just the money you make on the job—there is a lot of satisfaction from that pleasant surprise of the owner when you turn on KIRLIN built-in lighting.

Your customers are getting adequate, diffused light from above. They are satisfied, and so are you, for the Kirlin installation method costs less! . . . The frame is always flush with ceiling even though the box is not level or flush.

NO LIGHT-LEAKS





Pat'd and Pat. Pend.

A Mounting bars **C** Junction box
B Romex or RC wire **D** Heat-insulated
E AF wire pigtails

Why You Profit with Kirlin

INSTALLATION COSTS ARE LESS

REGULAR BUILDING WIRE RUNS DIRECT TO HEAT-INSULATED JUNCTION BOX

NO CARPENTER WORK IS NEEDED

- ★ Made in all sizes—square or rectangular—and in fluorescent
- ★ Alzak GlasSurfaced Aluminum reflectors
- ★ Hinged Rust-resisting Doors in Die-cast Frames
- ★ Individually packed for shipping
- ★ Spread-type or concentrating lens
- ★ UL and IBEW labels

IN STOCK AT LEADING WHOLESALERS EVERYWHERE

LARGEST SELLING RECESSED LINE—MILLIONS IN USE EVERYWHERE

The KIRLIN CO. 3435 E. JEFFERSON AVE. DETROIT 7, MICHIGAN

Tops in Quality
Competitive in Price.

why New DIEHL Type "D" Motors *are your best motor buy...*

Motors that require least maintenance, stay on the job longest and deliver peak performance under the most severe operating conditions assure *maximum value per dollar invested.*

These desired characteristics are inherent in the
NEW DIEHL TYPE "D" MOTORS

STATOR INSULATION is doubled in dielectric strength and exceptionally resistant to moisture, oil, chemicals and abrasion.

LEADS are specially insulated, last longer. Occupy less space. Permanently numbered to save wiring time.

BALL BEARINGS are oversize to provide excess load capacity. Pre-lubricated for years of trouble-free service.

INDESTRUCTIBLE ALUMINUM ROTORS. Keyed to the shafts in most frame sizes to prevent looseness under unusual and severe load conditions.

These, *and many other features*, backed by 68 years of motor-building experience, make Diehl Motors *your* best motor buy. We will welcome an opportunity to provide detailed information on Diehl Motors to meet your specific requirements.

Former N.E.M.A. Standard frame sizes still available for interchange and replacement.

Cutaway view of new Diehl Type "D" Motor

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins

☐ Type "J" Power Transmitter Bulletin No. EC-3303.

☐ Consolidated Motor Catalog and Price List No. EC-3310

Name_____

Company_____

Street_____

City_____ State_____

OTHER INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

. . . and for
GENERAL ELECTRIC'S
HANFORD ATOMIC ENERGY WORKS
signal and alarm equipment that protects resources and premises was designed and produced by **Auth**

Wherever you go, you find Auth equipment "doing a job" for industry. Supervisory annunciators warn of danger. Bells, horns and chimes sound period, paging or alarm signals. Intercom telephones, group reset clocks and fire alarms promote efficiency and safety. For information on industrial signal equipment write to
Auth Electric Company, Inc., Long Island City 1, N. Y.

Auth
SINCE 1892

SIGNALING, TIME AND COMMUNICATION SYSTEMS FOR HOSPITALS, SCHOOLS, HOUSING, INDUSTRY AND SHIPS

CRESCENT

TYPE UF

UNDERGROUND FEEDER and BRANCH CIRCUIT CABLE

CRESCENT -- TYPE UF -- 12/3
CRESCENT -- TYPE UF -- 12/3 CRESCENT -- TYPE UF -- 12/3
CRESCENT -- TYPE UF -- 12/2
CRESCENT -- TYPE UF -- 12/2 CRESCENT -- TYPE UF -- 12/2 CRESCENT -- TYPE UF -- 12/2

Also listed by Underwriters' Laboratories as

TYPE NMC – NON-METALLIC SHEATHED CABLE

Type UF Underground Feeder and Branch Circuit Cable is a new type first adopted in the 1953 National Electrical Code. It is recognized in single conductor construction, sizes #14 to #4 A.W.G. inclusive and in two-conductor and three-conductor flat construction, sizes 14, 12 and 10 A.W.G. CRESCENT SYNTHOL TW thermoplastic compounds are used in insulation and jackets of these cables.

Multiple Conductor Type UF Cables are also listed as Non-Metallic Sheathed Cable, Type NMC, and may be used for both exposed and concealed work in dry, moist, damp or corrosive locations and in masonry block walls.

Type UF single and multi-conductor cable is designed to be used underground, including direct burial, on feeders or branch circuits, when provided with overcurrent protection not in excess of the rated capacity of the individual conductors.

Send for Descriptive Bulletin

CRESCENT WIRE & CABLE

OVER 70 YEARS EXPERIENCE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

Now! . . .

An INTERRUPTING RATING in EXCESS of 100,000 AMPERES *for every set of fuse clips in your plant* . . . simply by installing FUSETRON *dual-element* FUSES

The Biggest Electrical Protection NEWS Since BUSS invented the FUSETRON Dual-Element FUSE

FUSETRON is a trademark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

In 1947 tests made by the Electrical Testing Laboratories of New York, showed that on a circuit set to deliver 50,000 amperes, FUSETRON fuses in all tests cleared the circuit safely.

50,000 amp. Interrupting Capacity in 1947
becomes
100,000 amp. Interrupting Capacity Today

After years of intensive development work on FUSETRON fuses new tests were conducted under conditions that simulated the most severe field conditions and these tests were witnessed and verified by the Electrical Testing Laboratories of New York.

On circuits set to deliver in excess of 100,000 amperes, 30 to 600 ampere, 250 and 600 volt FUSETRON dual-element Fuses on each and every test cleared the circuit without belching flame or venting hot gases and with comparatively little noise.

Oscillograms of these tests interpreted by the Electrical Testing Laboratories, showed that the total available amperes including the direct current component, reached values as great as 165,000 peak amperes on 240 volt tests and as high as 212,000 peak amperes on the 535 volt tests.

This indicates that an interrupting rating of 100,000 amperes for FUSETRON dual-element fuses is a conservative one.

No interference with time-lag

In the development work to increase interrupting capacity in FUSETRON fuses it was kept in mind that the time-current characteristic must be maintained. Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses.

Remarkable results have been achieved. Interrupting capacity has been greatly increased while the time-current characteristic of FUSETRON fuses has in no way been disturbed.

Play Safe – install Fusetron Fuses throughout the entire electrical system!

Think!...

ALL THIS ADDED SAFETY *without changing a panelboard or switch... plus* 10 Point Protection of FUSETRON *dual-element* FUSES!

Maximum Safety

With FUSETRON Fuses there is no cascading of interrupting rating — no places where an excessive fault current might cause serious damage. Every FUSETRON fuse has an interrupting rating in excess of 100,000 amperes.

You don't have to worry about selecting chosen spots in which to *pay extra* for "safe" equipment. Wherever a FUSETRON fuse is installed you have safety as sure and dependable as you can buy — no matter what you pay.

No Maintenance Costs

When FUSETRON fuses have once been installed properly you can forget about them. They need no periodic inspections to see if they will operate safely.

Dust, fumes, corrosion or age cannot prevent a FUSETRON fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

With FUSETRON fuses — you get safety — without one cent spent for inspection or maintenance costs.

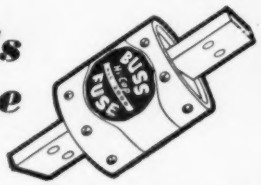
No Recalibration Costs

When a FUSETRON fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS— a fuse that is as safe and dependable as the one that blew.

PLUS 10 POINT Protection with FUSETRON dual-element FUSES

1 Protect against short-circuits. **2** Protect against needless blows caused by harmless overloads. **3** Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation. **4** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5** Protect motors against burnout from overloading. **6** Protect motors against burnout due to single phasing. **7** Give DOUBLE burnout protection to large motors — without extra cost. **8** Make protection of small motors simple and inexpensive. **9** Protect against waste of space and money — permit use of proper size switches and panels. **10** Protect coils, transformers and solenoids against burnout.

for SAFE PROTECTION on loads above 600 and up to 5000 Ampere install BUSS Hi-Cap FUSES



Tests have shown that BUSS Hi-Cap fuses have unlimited interrupting capacity on circuits of 600 volts or less.

They are designed to give protection against dangerous overloads as well as high fault currents — yet their speed of operation on heavy shorts limits currents to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

When coordinated properly with FUSETRON dual-element fuses they will not open ahead of the fuses nearest to the fault. Thus trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of a bad fault.

ACTION THAT SAVES YOU MONEY

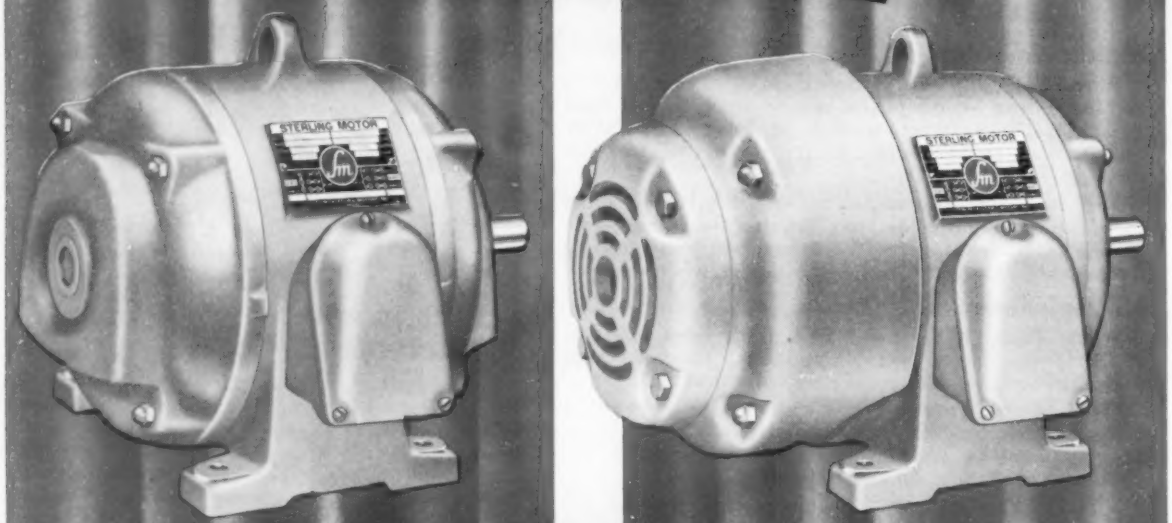
By passing the word along that all purchase and stock records should call for FUSETRON fuses on loads up to 600 amps—and BUSS Hi-Cap fuses on loads above that — you get action that begets money saving.

For blowing time charts or more information on FUSETRON Fuses and BUSS Hi-Cap Fuses write for Bulletins FIS and HCS.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. Division McGraw Electric Company

MORE HORSEPOWER... IN LESS SPACE...

with the **NEW STERLING** *Motor Line*



KLOSD DRIP-PROOF CONSTANT NORMAL SPEED MOTORS

NEW NEMA MOUNTING DIMENSIONS

KLOSD-TITE FAN-COOLED CONSTANT NORMAL SPEED MOTORS

PLUS...

THESE 10 STERLING ADVANCED DESIGN FEATURES

- Over 50% less inactive space
- Protected construction
- Greater bearing protection
- Advanced design terminal box
- Heavy duty ball bearings
- Herringbone rotor
- Direct-through ventilation
- Increased efficiency and performance
- Stator windings of advanced design
- Improved insulation

WRITE FOR NEW BULLETIN NO. E-416-A.

STERLING ELECTRIC MOTORS

New York City 51; Chicago 35; Los Angeles 22; Hamilton, Ont., Canada; Santiago, Chile

how much light for a dollar?

In lighting, your customer's initial costs are not his real costs. His real costs are the sum of these first costs including installation *and operating and maintenance expenses during the life of the system.*

Time and again, fewer Smithcraft fluorescent lighting units are required to produce recommended lighting results. Because fewer Smithcraft units are needed, your customer's initial costs are lower but his really big savings are in the lower power costs and lower maintenance costs that go with fewer units.

On a typical factory installation lighting 20,000 square feet of floor space, for example, the A.L.S. Factory Lighting Unit will save roughly $8000 over a ten-year period, when compared with a typical industrial fixture with 6-10% uplighting (design and performance conforming with RLM standards.) So, it's possible for your customer to enjoy the benefits of the finest lighting money can buy and effect really substantial savings at the same time, simply by buying the right fixture. Ask us to send you our A.L.S. Factory Lighting Folder.

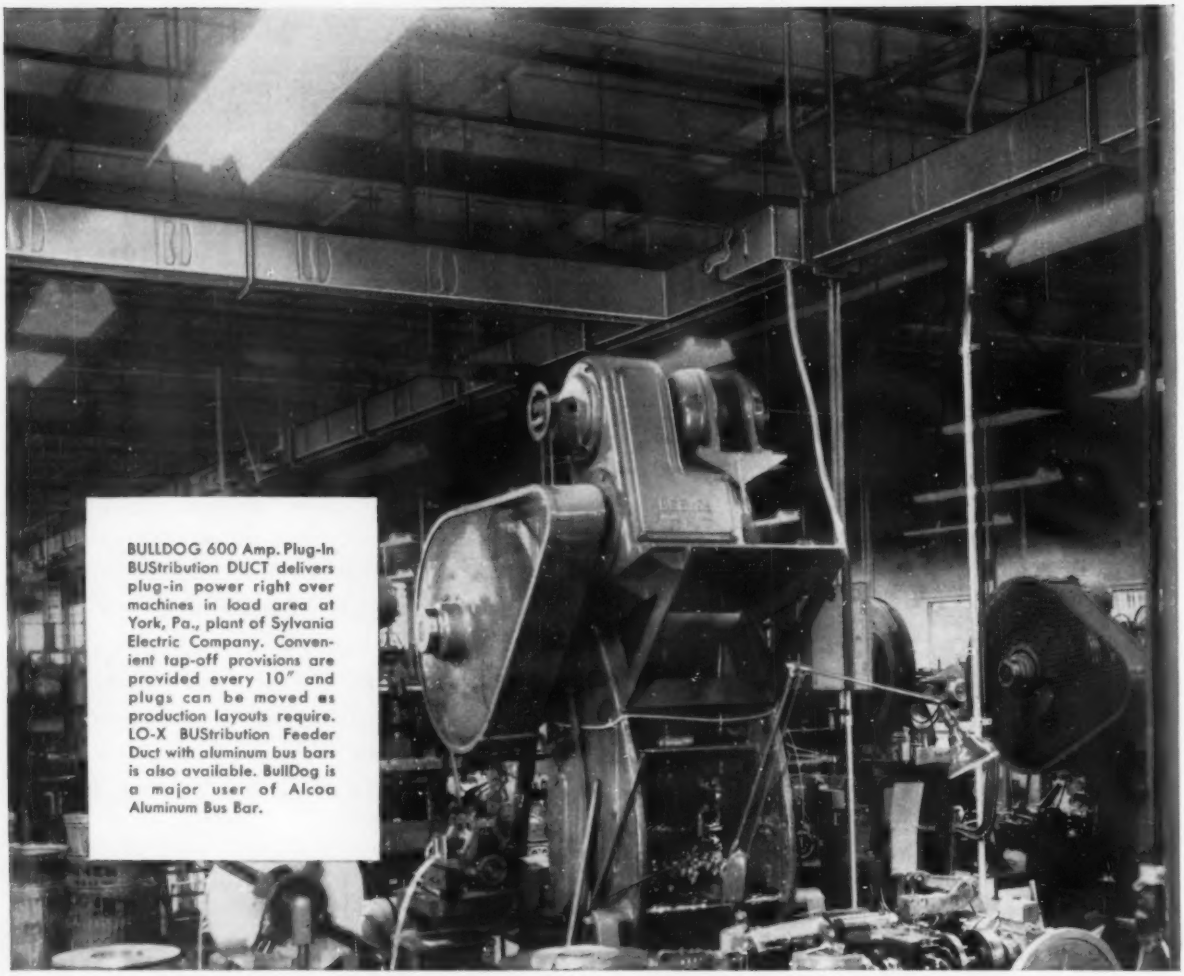
PHOTOGRAPH SHOWS INSTALLATION OF 4450 SMITHCRAFT A. L. S. UNITS LIGHTING 397,000 SQ. FT. TO 75 FOOTCANDLES.

BUY LIGHTING — NOT FIXTURES. *INVEST* IN AMERICA'S FINEST FLUORESCENT LIGHTING by

Smithcraft

LIGHTING DIVISION

CHELSEA 50, MASSACHUSETTS



BULLDOG 600 Amp. Plug-In BUStribution DUCT delivers plug-in power right over machines in load area at York, Pa., plant of Sylvania Electric Company. Convenient tap-off provisions are provided every 10″ and plugs can be moved as production layouts require. LO-X BUStribution Feeder Duct with aluminum bus bars is also available. BullDog is a major user of Alcoa Aluminum Bus Bar.

YOU CAN SAVE 10% ON BUS DUCT WITH ALCOA ALUMINUM BUS BAR!

The initial cost of Alcoa® Aluminum Bus Bars allows BullDog and other manufacturers to price this superior product lower than bus duct using other conductor materials. Since aluminum bus bars are as much as 41% lighter than copper bus bars, bus duct with aluminum bus bars assures easier, less costly installation and relocation with decidedly less strain on building superstructures. Bus duct with aluminum bus bar is completely interchangeable with other bus duct systems.

Wherever or whenever production requirements demand an efficient, flexible electrical distribution system, specify bus duct with Alcoa Aluminum Bus Bars. For the names of manufacturers using this modern electrical metal in their bus duct systems, write: ALUMINUM COMPANY OF AMERICA, 2108-E Alcoa Building, Pittsburgh 19, Pa.

THE MODERN ELECTRICAL METAL

ALCOA ALUMINUM

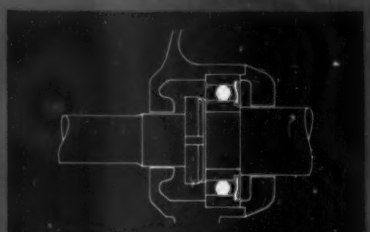
ALUMINUM COMPANY OF AMERICA

Here's another reason why

the NEW L.A. *Line*

by the Louis Allis Co.

is your BEST *electric motor* BUY

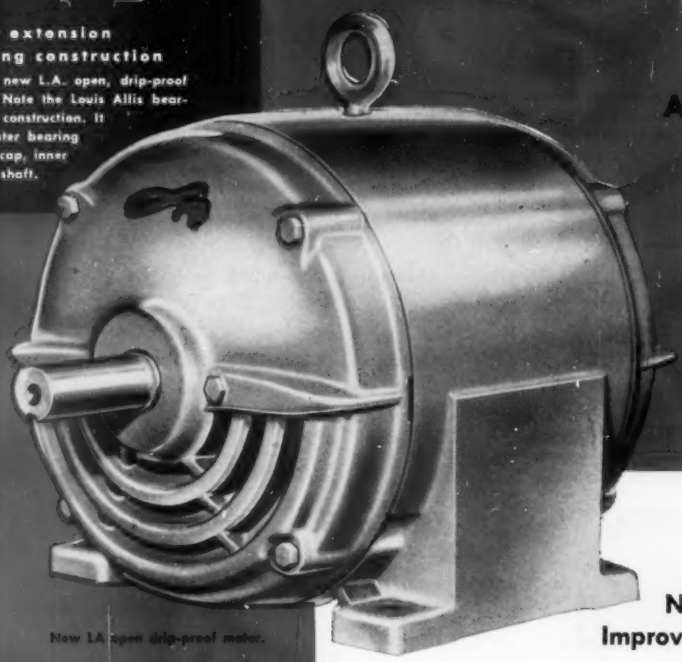


Shaft extension bearing construction

used in new L.A. open, drip-proof motors. Note the Louis Allis bearing-cap construction. It locks outer bearing race to cap, inner race to shaft.

A brand-new power package, completely redesigned inside and out

with NEW BEARING CONSTRUCTION



New LA open drip-proof motor.

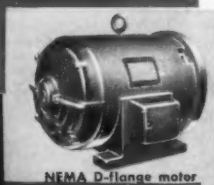
plus

New modern styling
More compact design
New conduit box arrangement
Improved ventilation and better protection
More versatile mounting

We specialize in
SPECIAL MOTORS *and*
PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

Vertical NEMA C-flange motor



NEMA D-flange motor

NEMA C-flange motor

HERE'S the locked bearing construction that makes the new L.A. motors even better—gives them extra life, extra dependability. It positions the rotor . . . limits shaft end-play . . . gives you ample V-belt drive capacity. You get factory prelubrication, too, with a new, improved grease-retaining system that saves servicing and maintenance — for years of attention-free operation under most conditions.

That's not all! You get standard bearings in every unit — sizes specially selected to be easily obtainable from local stocks. And there's no need to tear the motor down to get bearing numbers — they're stamped right on the new motor nameplate.

Add this modern, dependable bearing construction to all the other features and you see why the L.A. line is your best motor buy. Get the complete story from your nearby Louis Allis Sales Engineer.

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

LA-105

Streamlined gland glides over rafters and other obstructions when running precoupled lengths.

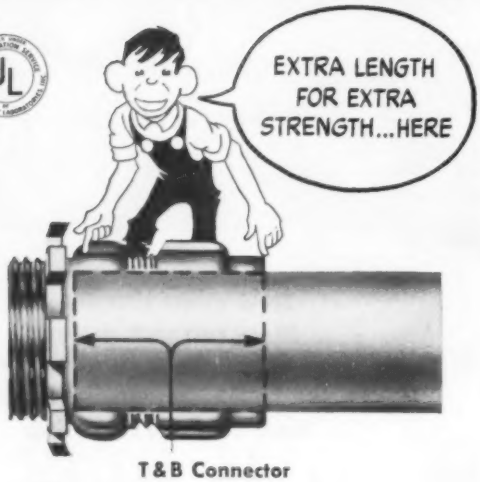
Connector threads are long enough to take double locknuts wherever required.

New Another T&B ENGINEERED Design

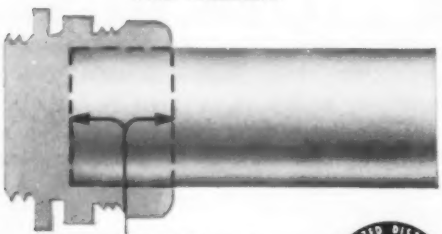
ALL STEEL E.M.T. COUPLINGS AND CONNECTORS

stronger, straighter runs because they're

LONGER



T&B Connector



Conventional Connector

It's because they're as much as 50% longer than conventional fittings for E.M.T. The extra-deep throat in T&B's new line of steel E.M.T. fittings provides a much greater area of firm, rigid support for the tubing wall. Conduit *has* to line up properly. Runs are straighter. Greater length also allows more tolerance when cutting—you save time when making adjustments for conduit cut a little too long or short.

All steel construction – body, gland, ring and locknut – is your assurance of uniform strength and dimensional accuracy. Additional space inside the body prevents skinned or damaged wiring during pulling.

They're easy to install. Simply run up gland nut and the entire assembly tightens in place. Same wrench size fits both body and gland hexes. UL Raintight Approved.

A complete line of T&B Couplings and Connectors are available for ⅜″ to 2″ E.M.T. Order a supply today for your next job . . . or . . . send to T&B for free samples and additional literature.

LOOK FOR THIS SIGN – AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T&B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T411

THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

ROMEX®

TYPE NM NON-METALLIC SHEATHED CABLE

MADE ONLY BY GENERAL CABLE!

ROMEX is a registered Trade Name owned by General Cable!

General Cable originated, introduced and still supplies the only Non-Metallic Sheathed Cable *known* as ROMEX!

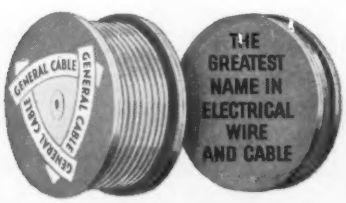
The nationwide preference for ROMEX for use in homes, stores and small buildings is based on its outstanding service record. A record that is clear evidence of the superior quality of ROMEX. You can get ROMEX in 2, 3 and 4 conductors with or without ground.

Ask for ROMEX by name! Specify General Cable! It's the only way you can be sure of getting the real ROMEX! Don't settle for less!

Now packed in new, exclusive crush-resistant cartons:

All types ROMEX 2 and 3 conductor with and without Ground Wire. ROMEX UF. All types R, RH, RH-RW and TW in circuit sizes. Packaged Weatherproof. Staneon Gas Tube and Oil Burner Wire. Trench-lay Type UF

...with more to come



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

Remember—if it isn't General Cable it isn't ROMEX!

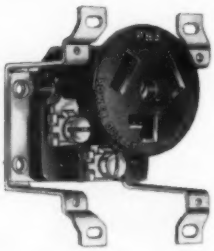
GENERAL CABLE CORPORATION

420 Lexington Avenue, New York 17, New York • Sales Offices: Atlanta • Buffalo Cambridge (Mass.) • Chicago • Cleveland • Dallas • Detroit • Greensboro (N. C.) • Houston Indianapolis • Kansas City • Los Angeles • Milwaukee • Minneapolis • New York • Newark (N. J.) • Philadelphia • Pittsburgh • Portland (Ore.) • Rome (N. Y.) • Rossmoyne (Ohio) (Cincinnati area) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

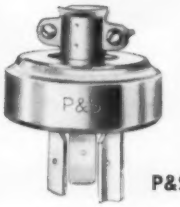
P&S

30-AMPERE, 3-WIRE DEVICES for Safe, Dependable Dryer and Heater Connections

P&S 3836

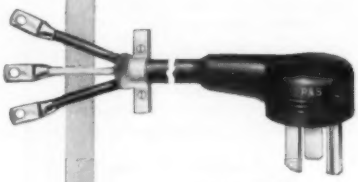


P&S 3835



P&S 9337

P&S 9331



P&S 9339

A Complete Line . . . Receptacles, Caps, Cord Sets

with

L-Shaped Grounding Slots and Blades Designed for Quick, Easy Wiring

"Lay-in" type pressure terminals on both flush and surface receptacles. No loose pieces to be handled or misplaced.

P&S 3836, surface receptacle, has ¾" and 1" knockouts for conduit in bottom and back, and is available in brown or white (3836-W). P&S 3835 is designed for mounting on standard 4" box, with P&S 3848 Ivory-X or P&S 3849 Chrome-X plates.

Cord grip caps are heavily armored and finished to resist corrosion. Sturdy P&S 9339 cord set is non-separable, molded rubber type with three No. 10 wires.

Cash in on the increasing demand for dryer and heater connections with these new P&S devices. Place your order on your P&S distributor today.

For complete catalog, write Dept. M

ADEQUATE WIRING SERVES AND SAVES — THE KEY TO ELECTRICAL LIVING

Approved by Underwriters Laboratories

PASS & SEYMOUR, INC. • SYRACUSE 9, N. Y.

OFFICES: 71 Murray St., New York 7, N. Y. 1229 W. Washington Blvd., Chicago 7, Ill.

To know you're right... replace with

Delco Motors

You can depend on Delco motors to **keep going** in the face of the severest conditions. They are designed, engineered, and built to precision standards to minimize servicing and down-time.

When you need motor replacements—fast—call for Delco. They're available everywhere through local Delco motors distributors.

There's a Delco
for Practically Any
Industrial Application

Open and enclosed motors up to 100 h.p. for standard foot mountings. NEMA C&D flange-mounted motors up to 30 h.p. Explosion proof motors up to 20 h.p.

DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

SALES OFFICES:
ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS
DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS
SAN FRANCISCO

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

DISTRIBUTED BY WHOLESALERS EVERYWHERE

These Features tell you why you're Right with Delco

Water-Tight Conduit Box. Protects against moisture.

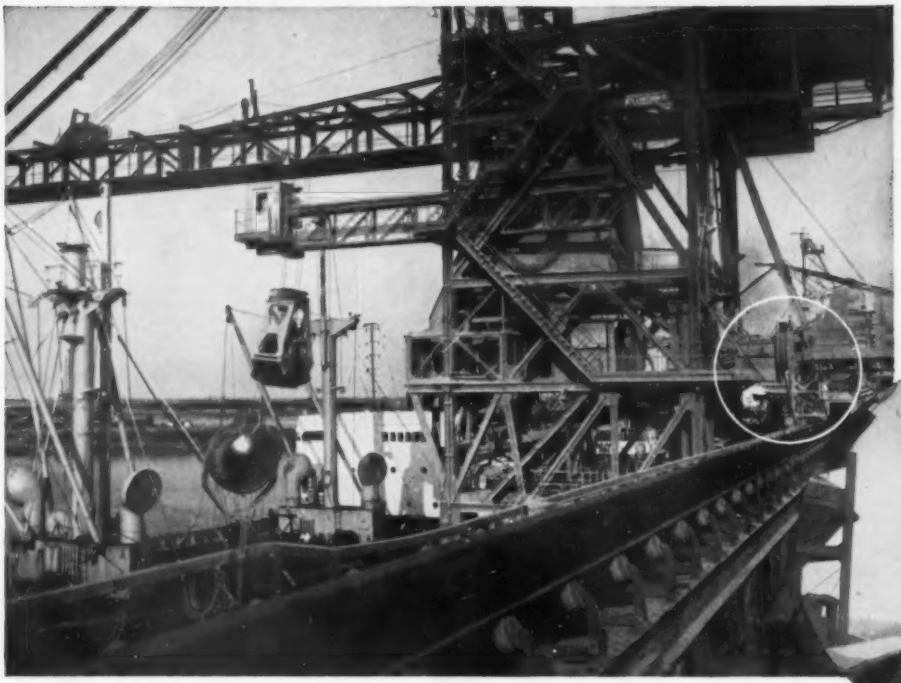
Positive Lubrication. Lengthens bearing life.

Delcote Insulation. Permanently flexible, moisture-proof, wear resistant.

Positioned Bearings. Maintain shaft alignment.

Dynamically Balanced Rotor and Shaft Assembly. Reduces vibration.

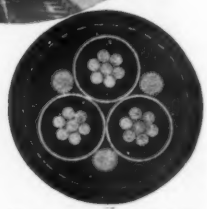
Corrosive-Resistant Cast Iron Frame. More solid, more rugged.



Alabama State Docks Bulk Material Handling Plant utilizes Hazacord in a unique take-up reel feeder for the overhead loading structure.

Close-up of the take-up reel shows the supporting bars for the cable alongside the conveyor belt.

Modern bulk material handling plant uses HAZACORD for SAFETY and DEPENDABILITY



Hazacord Type SH-D

Overhead loading structure power distribution at the new addition to the $5,000,000 Alabama State Docks Bulk Material Handling Plant at Mobile required a high safety factor as well as long-term dependability. Previous construction involved contactors riding on open bus bars which were frequently damaged by falling ore and were hazardous to personnel.

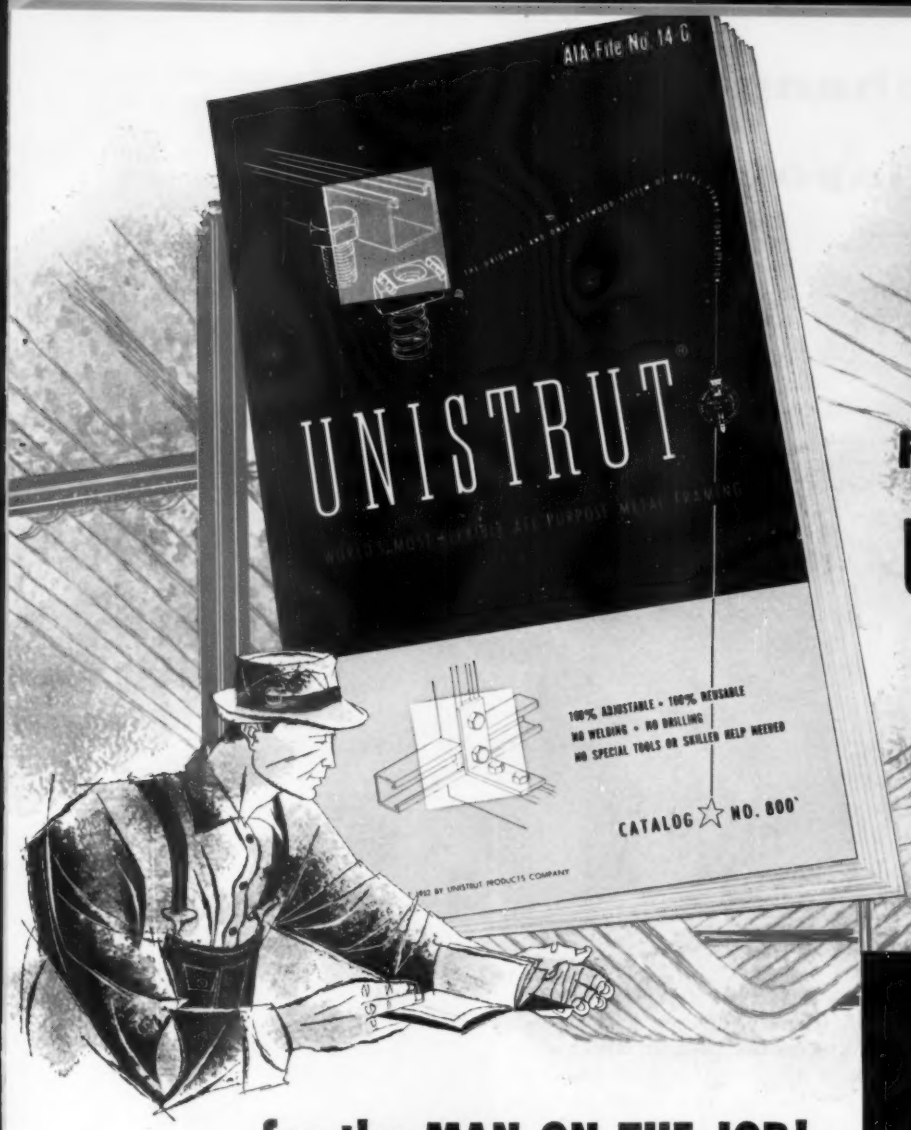
A constant torque take-up reel equipped with 650 feet of Hazacord Type SH-D supplies the power to the new loading structure. The 5,000-volt cable is supported as it is paid out by 14″ rods extending out from the side of the conveyor belt at 5′ intervals. The structure can move 630′ in either direction from the origin of the cable.

Such unusual installations as this indicate the wide variety of applications for the toughness and dependability of Hazacord Portable Cables. The tough Hazaprene sheath is resistant to the abrasion and compression as well as abuse from falling ore found in these operations. Weather resistance and the ability to withstand the attacks of acids, alkalies, moisture and most oils make Hazacords the logical choice for all portable power circuits up to 15,000 volts.

Your Hazard representative can recommend the correct Hazard cable for your requirements or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZACORD *Mold-Cured* **portable cables**

2134


AIA File No. 14-G
UNISTRUT
100% ADJUSTABLE • 100% REUSABLE
NO WELDING • NO DRILLING
NO SPECIAL TOOLS OR SKILLED HELP NEEDED
CATALOG NO. 800

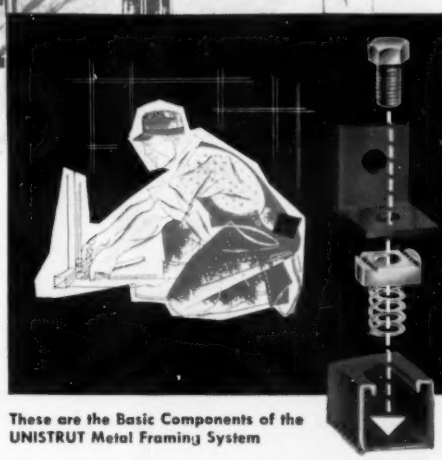
New FREE 84 PAGE UNISTRUT® Pocket Catalog NO. 800

for the MAN ON THE JOB!

84 pages crammed with ideas, pictures and data on how to frame, hang, support and mount all kinds of mechanical and electrical equipment with adjustable UNISTRUT All-purpose Metal Framing.

Perfect for the man on the job—most useful, too, as a handy reference catalog for the architect, engineer, draftsman, contractor, or builder. Just pocket size, easy to handle, always within reach when you want it. Order your free copy of the *NEW* UNISTRUT Catalog No. 800 today! With UNISTRUT channel and fittings you can build all types of conduit, cable, pipe and tubing hangers and supports, framing, mounts, racks, tables, benches, and many other structures with just a hacksaw and a wrench. No drilling, no welding, 100% adjustable and re-usable.

The UNISTRUT system of mechanical supports provides great strength without bulk. It's easy to work with, lasts indefinitely, and the finished structure assures neat and orderly appearance.



These are the Basic Components of the UNISTRUT Metal Framing System

Write for your copy today! FREE

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois Dept. 4

Please send me a copy of the new UNISTRUT Pocket Catalog No. 800, without obligation.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

UNISTRUT Products are Bonderized

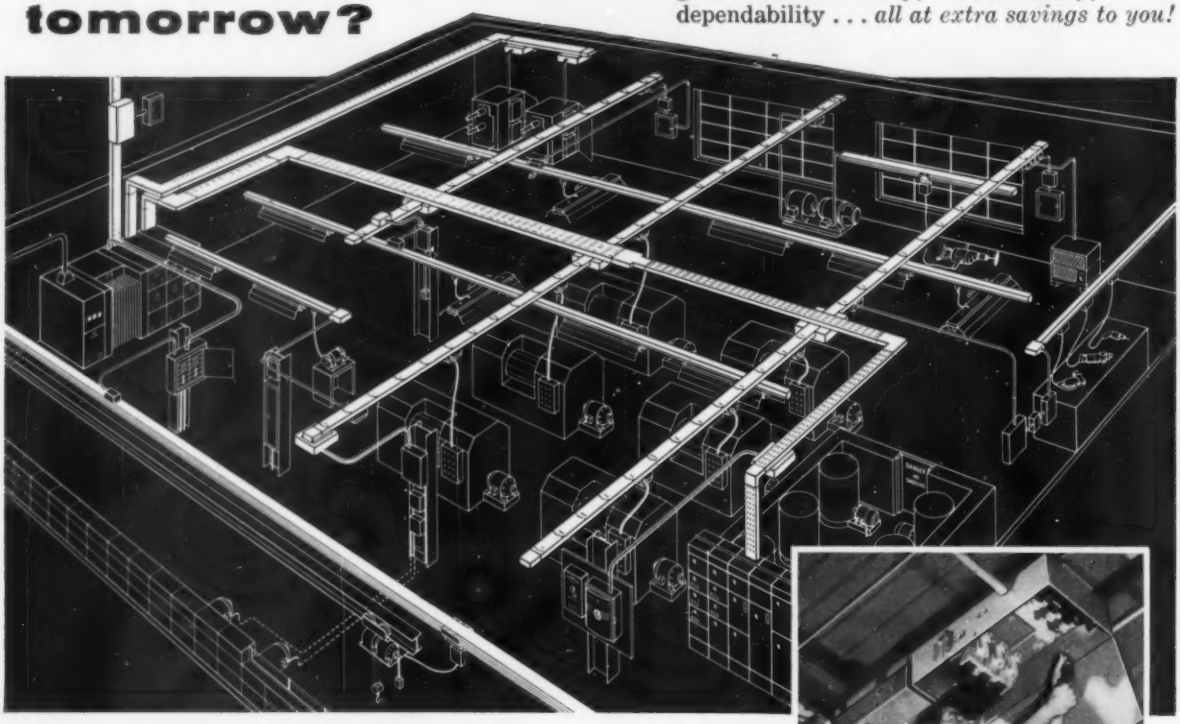
U. S. Patent Numbers: 2327587 2329815 2345650 2363382 2380379 2405631 2541908
Other Patents Pending

The World's Most UNISTRUT **Flexible All-Purpose Metal Framing**

Distributors and Warehouse Stocks in Principal Cities—Consult your Telephone Directories

Could you change YOUR plant layout tomorrow?

You could . . . easily and economically . . . with the help of a General Electric *integrated* power distribution system, which has exceptional flexibility and capacity *built in.* For G-E busways, control centers, panelboards and other equipment, working as a system, give extra mobility, extra safety, extra dependability . . . *all at extra savings to you!*



FLEX-A-POWER, G.E.'s modern busway system, takes guesswork out of plans for power distribution. It can be altered or extended. It can be dismantled in one building and re-installed in another — quickly, easily and with complete re-use of all units. It points the way to greater plant efficiency, flexibility and safety. It's ready for the future today.

G-E Motor Control Centers, with instantly accessible, all-purpose plug-in units, are designed to meet the challenge of change . . . quickly and inexpensively.

G-E Panelboards. A broad line of lighting and distribution panelboards, fusible and circuit breaker types, have fast wire-in features . . . make circuit additions or changes simple.

FOR DETAILS, WRITE GENERAL ELECTRIC COMPANY,
DISTRIBUTION ASSEMBLIES DEPARTMENT, PLAINVILLE, CONN.

From power line to production line, make it G.E. all the way.

GENERAL ELECTRIC

give those bright young eyes
a chance to stay bright with

GUTH SCHOOL LIGHTING

... sight-saving, low-brightness. No glare and gloom to haunt the classroom ... no torturing eye-strain. Easier lessons, healthier, happier students and teachers.

Fluorescent or incandescent—economical in purchase, installation and maintenance.

Write for details on Guth school lighting today.

THE EDWIN F. GUTH CO. • ST. LOUIS 3, MO.

Leaders in Lighting since 1902

M. BLACK MFG. CO.

Announces

A Dramatic New Line of Lamp Holders and Accessories

Smart, New Design in Beautiful, Amazing

KROMELOY

Weather-Resistant, Chrome-Like

CAST ALUMINUM

- MINIMUM POROSITY
- CORROSION RESISTANT
- NO MAINTENANCE

CAT. NO. YL-50—DE-LUXE YARDLIGHT WITH VAPOR PROOF FITTING AND GLOBE.

CAT. NO. 136—LAMP HOLDER FOR PAR-38 BULB, WIRED WITH 20" OF FIXTURE WIRE FULLY ENCLOSED, SHOWN WITH #138, 2" SLIP FITTER.

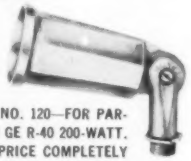
So Eye-Appealing in Beauty! So Budget-Appealing in Price!

CAT. NO. 175-B—ALL METAL SPOTLIGHT HOLDER COMPLETE WITH 6' CORD AND RUBBER PLUG, FURNISHED WITH SEPARATE WEATHERPROOF GASKET, WITH SPIKE.

CAT. NO. 137—MOGUL BASE HOLDER FULLY ENCLOSED WITH 20" OF FIXTURE WIRE.

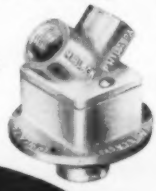
The new M. Black line of lamp holders and accessories must be seen to be appreciated. Gleaming chrome-like finish on cast aluminum gives longer life, increased resistance to the elements, reduces maintenance to practically zero . . . Inter-connecting flexibility of units permits unusual wide range of adaptability to every purpose . . . higher quality, lower cost. Write for complete catalog.

CAT. NO. 206—ACORN SPLICE BOX WITH REMOVABLE LID.



CAT. NO. 120—FOR PAR-38 OR GE R-40 200-WATT. LOW PRICE COMPLETELY ENCLOSED WIRED UNIT.

CAT. NO. YL-40—DELUXE YARDLIGHT WITH GREEN AND WHITE ENAMEL SHADE.



CAT. NO. 177—Y-TYPE FLANGE SPLICE BOX.

CAT. NO. 144—CURVED SPLICE BOX WITH REMOVABLE COVER.

M. BLACK
MANUFACTURING COMPANY

300-308 N. THIRD STREET • PHILADELPHIA, PA. • *Manufacturers of Electrical Accessories for Home and Industry*

Dust, Grit, Fog or Fumes
CAN'T GET UNDER THE "SKIN"

of your Century

TOTALLY
ENCLOSED
FAN
COOLED MOTORS

The inner frame of your Century TEFC Motor completely seals all the vital working parts against air-borne hazards. An effective stream of air blown between the inner and outer frames, keeps the motor temperature within safe limits at rated load.

Century TEFC motors operate your equipment efficiently in any kind of atmosphere — resist dusts, dirt, chemical or oil fog, and mists.

Whatever the job or working conditions, Century's wide line of types, sizes, and variety of operating characteristics, enables you to select the motor specifications for top equipment performance.

⅛ to 400 horsepower ratings — A.C. or D.C.— Furnished in Drip Proof — Splash Proof — Dust Proof — or Explosion Proof frames — for most all atmospheric surroundings.

Specify Century motors on your new equipment or replacements. Your nearby Century District Sales Office or Century Distributor will be glad to give you full information.

Century C MOTORS

CE-765

CENTURY ELECTRIC COMPANY • 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

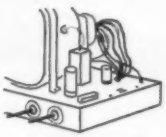
First time available NEW DUTCH BRAND Vinyl COLOR TAPE

Electrical insulating, Indexing, Color coding

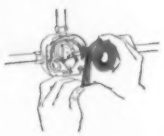
A GREAT NEW PROFIT-MAKER FOR YOU BY DUTCH BRAND

Wherever color can help you in manufacturing operations, the great new line of DUTCH BRAND Vinyl COLOR TAPES will prove useful to you. For the first time you can do just about every industrial taping job, and do it in color.

They have a high resistance to the average destructive elements such as grease, oil, acids and corrosive chemicals. Use it for such jobs as indexing of parts, tools, materials being tested, stock shipments, etc. It is ideal for all holding, reinforcing, splicing, perfect for neat work on color wiring in electronic assemblies. UL listed. Check the remarkable characteristics of DUTCH BRAND Vinyl COLOR TAPE.

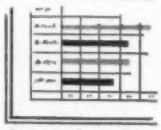

electrical insulating

color coding


electric wiring

tool handles

The Tape with a Thousand Uses


charts and graphs

UL listed

decorating

color indexing

CHARACTERISTICS

Adhesive Value—28 oz. per inch width (according to ASTM D1000)
Tensile Strength—15 lbs. per inch width
Dielectric Strength—1000 volts per mil of thickness
Thickness—0.006
Moisture Vapor Transmission Rate—Less than 3

JOHNS-MANVILLE DUTCH BRAND VAN CLEEF DIVISION

Johns-Manville
DUTCH BRAND PRODUCTS
VAN CLEEF BROS., INC. DIVISION
7800 WOODLAWN AVENUE CHICAGO 19, ILL.

ORDER FROM YOUR INDUSTRIAL DISTRIBUTOR

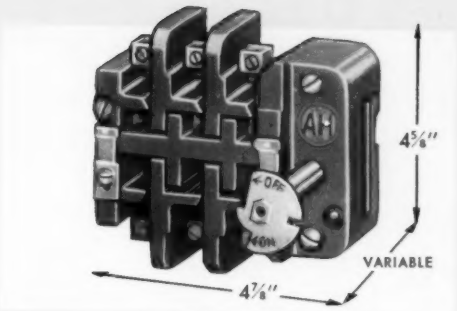
ARROW·HART

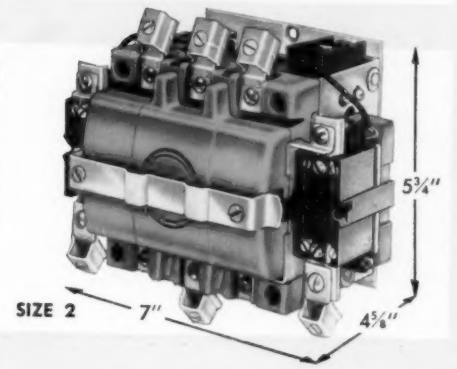
"RAD" Disconnect

ARROW AH HART

PLUS

ADVANCED DESIGN TYPE "RA" Motor Starter





provides you with the FINEST COMBINATION ON THE MARKET

Here's why... TYPE "RAC"

"RAD" DISCONNECT . . .

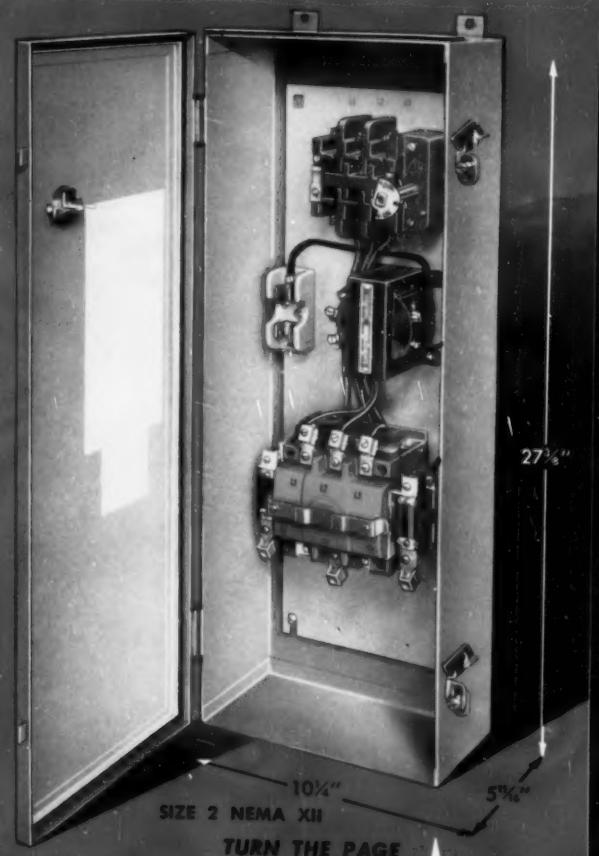
is a completely new, front operated design offering important advantages for both safety and convenience including: HEAVY, DOUBLE BREAK, BUTT TYPE SILVER CONTACTS for long life • COMPLETELY VISIBLE CONTACTS so maintenance man can SEE that Disconnect is off • CONTACTS ON VERTICAL PLANE prevent accumulation of breakdown material • CONTACT CARRIER INSTANTLY REMOVABLE for inspection or replacement • SIMPLE, SAFE, STURDY MECHANISM . . . cover can't be opened with Disconnect on, handle must be turned to "Open" with Disconnect "Off" •SELF-LOCATING HANDLE PROVIDES FOR THREE LOCKS and locks only in the "Off" position, as standard.

TYPE "RA" STARTER . . .

is a revolutionary, new design with a completely different type of operating mechanism. Important benefits made possible by this first real advance in motor control design in over 20 years include: GREATLY REDUCED SIZE and WEIGHT • IMPROVED PERFORMANCE and DEPENDABILITY • STRAIGHT-THRU FRONT WIRING • ALL PARTS EASILY ACCESSIBLE FROM FRONT • VERTICAL CONTACT POSITION prevents accumulation of dust.

TYPE "RAC" BOX . . .

features: SEAM WELDED CONSTRUCTION • FOAM NEOPRENE GASKET retained by channel in cover • MOUNTING PLATE REMOVABLE with all equipment without removing any screws • MINIMUM of 1" SPACING FROM ALL LINE and LOAD TERMINALS TO BOX • OIL DRIP SHIELD and EXTERNAL MOUNTING FEET • SELF-ALIGNING HANDLE • SELF-SECURING COVER LATCHES.



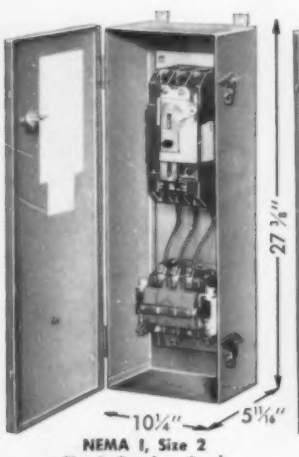
TURN THE PAGE FOR ADDITIONAL INFORMATION

THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD, CONNECTICUT

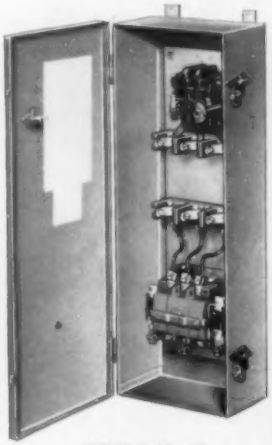
New TYPE "RAC" Combination Starters

AVAILABLE . . .

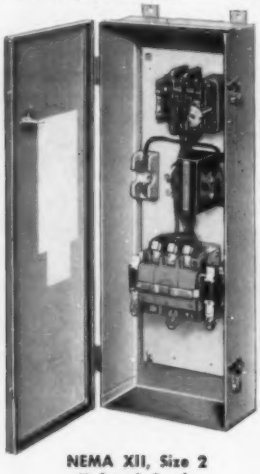
- With OILTIGHT (NEMA TYPE XII) ENCLOSURE . . . built to JIC STANDARDS
- With GENERAL PURPOSE (NEMA TYPE I) ENCLOSURE
- With DISCONNECT . . . Fused or Unfused Type
- With CIRCUIT BREAKER TYPE DISCONNECT
- ACROSS-THE-LINE, REVERSING and TWO-SPEED TYPES
- In NEMA SIZES 0, 1 and 2 . . . with 3 and 4 on the way
- With or without CONTROL CIRCUIT TRANSFORMER, LOCAL CONTROL and OTHER MODIFICATIONS



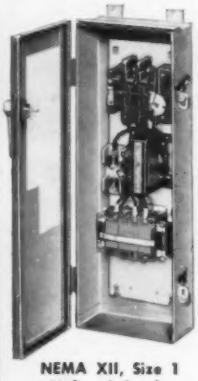
NEMA I, Size 2
Circuit Breaker Comb.



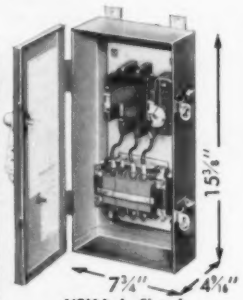
NEMA I, Size 2
Fused Comb.



NEMA XII, Size 2
Unfused Comb.



NEMA XII, Size 1
Unfused Comb.



NEMA I, Size 1
Unfused Comb.

Modernize all your electrical equipment with ARROW-HART Advanced Design MOTOR CONTROLS

Replace WITH ARROW-HART ON OLD MACHINES

A COMPLETE LINE FOR EVERY INSTALLATION NEED

Magnetic Starters and Contactors in Across-the-Line, Reversing and Two-Speed Types • Combination Starters • Explo-Safe and Weatherproof Starters and Contactors • Control Centers • Electronic Variable Speed Packaged Drives • "PPS" Push Pull Selector Switches • Push Button Stations in Oiltight, Standard Duty, Heavy Duty, Weatherproof and Explosionproof types • Midget Relays • Manual Starters and Starting Switches • Limit Switches . . . and Specialized Controls for Many Industries

Specify ARROW-HART FOR NEW MACHINES

SEND NOW FOR COMPLETE INFORMATION

Industrial Control Division
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 Hawthorn Street, Hartford 6, Conn.

☐ *Please send literature describing the Type "RAC" Combination Starter.*
☐ *Please send catalog covering the complete A-H Motor Control Line.*

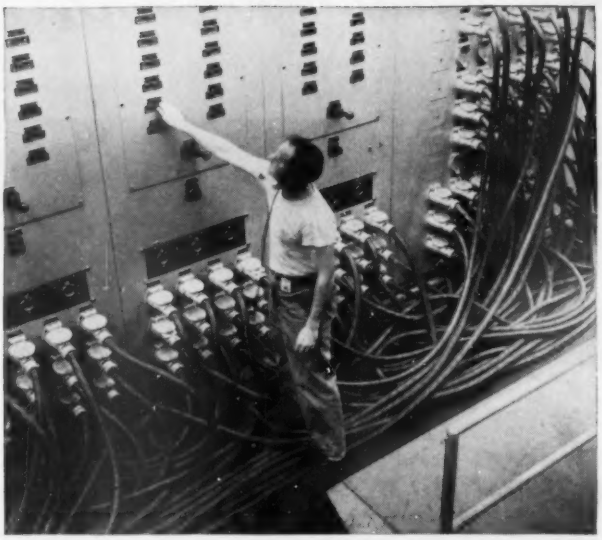
NAME_____
POSITION_____
COMPANY_____
CO. ADDRESS_____
CITY_____ ZONE_____ STATE_____

ARROW-HART
INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 HAWTHORN STREET, HARTFORD 6, CONN., U.S.A.

OFFICES, SALES ENGINEERS AND WAREHOUSES IN: ATLANTA, BOSTON, BUFFALO, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DETROIT, HOUSTON, INDIANAPOLIS, KANSAS CITY MO., LOS ANGELES, MILWAUKEE, MINNEAPOLIS, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, SAN FRANCISCO. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO.

PRINTED IN U.S.A.

SPECIFY... PYLE-NATIONAL



QUELARC PLUGS and RECEPTACLES in seventy-two foot plug board installed in the General Electric Company's Light Military Electronic Plant in Utica, New York.

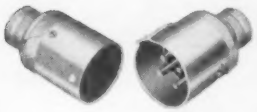
PLUGS AND RECEPTACLES

For More Efficient Plant Operation

DETACHABLE COMPONENTS On any equipment that must be disconnected for inspection, repair or replacement, plugs and receptacles quickly pay for themselves by saving man hours and shortening shut-down periods. Complicated multiple conductor connections are instantly and accurately broken and remade as polarization is not disturbed.

PORTABLE EQUIPMENT Located throughout a plant at all potential operating points, receptacles for plugging in electrical tools and other portable equipment, contribute greatly to the flexibility and efficiency of plant operation.

PLUG-IN BOARDS On power distribution panels and portable generators, plugs and receptacles provide a quick efficient means of selecting and routing electrical circuits to meet the special and varying requirements of testing and research operations.

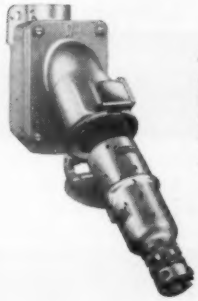


TRIPLOC*

Interchangeable and Reversible Series 250 volts, D.C.; 460 volts, A.C.; 2 to 12-poles, 15 and 20 amperes also multiple unit types 2 to 48-poles, 60 and 15 ampere combination circuits.

MIDGET TRIPLOC

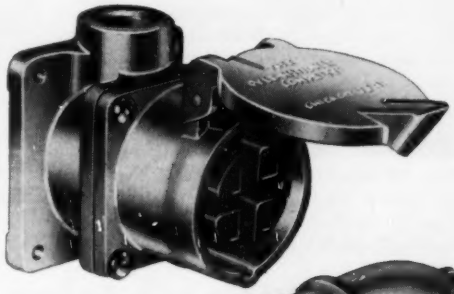
Interchangeable and Reversible Series 2, 3 & 4-poles; 10 amperes, 250 volts; 15 amperes, 125 volts.



STRATELINE*

for Hazardous Locations — Delayed Action Series 115 to 460 volts; 2 and 3-pole; 15 & 30 amperes.

*Trade Mark Reg. U.S. Pat. Off.



QUELARC*

Circuit Breaking Series
250 volts, D.C.,
600 volts, A.C.;
2, 3 & 4-poles;
20 to 200 amperes

Rugged insulation, positive polarization and grounding circuit provisions, meet strict safety requirements. Listed by Underwriters' Laboratories, Inc. Sold nationally through authorized electrical distributors. ***Write for descriptive bulletins.***

THE PYLE-NATIONAL COMPANY

1344 North Kostner Avenue, Chicago 51, Illinois

Branch Offices and Agents in Principal Cities of the U.S. and Canada • Canadian Agent: The Holden Co., Ltd., Montreal
Export Department: International Rail Supply Co., 30 Church Street, New York

SINCE 1897

CONDUIT FITTINGS • LIGHTING FIXTURES • FLOODLIGHTS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

IF IT'S PARANITE®
IT'S the RIGHT Wire and Cable

PARAFLEX Non-Metallic Sheathed Cable lays flat. Won't squirm or twist. Clean to handle. Plainly marked.

PARAUSE® Type "RR" cable provides permanent underground installation from power line to meter and for connecting several buildings. CAA approved under Specification L824.

HYDRO-THERM® Building Wire combines in a single wire the heat-resistant qualities of Type RH and the moisture resistant qualities of Type RW.

URC Weatherproof Wire and Cable can be relied upon to meet severe climatic conditions. Both actual line and Weather-Ometer tests prove unusual ageing characteristics.

SERVICE ENTRANCE CABLE, Type SE Style U unarmoured and Type SE Style A armoured. There is also a Paranite Service Drop Cable, two conductor, Type SD.

DREADNAUGHT® Heavy Duty Cable has lead-cured neoprene insulation. Flexible, durable, safe, long-lived. Cuts repairs and replacements. Delivers current continuously.

IF IT'S **PARANITE®** IT'S RIGHT!

PARANITE®

PARANITE WIRE AND CABLE

Division of ESSEX WIRE CORPORATION

FORT WAYNE 6, INDIANA

WIRES AND CABLES SINCE 1890

WAREHOUSES* AND SALES OFFICES: *Atlanta, Ga.; Boston, Mass.; *Chicago, Ill.; Cleveland, Ohio; Dallas, Texas; *Detroit, Mich.; Hartford, Conn.; Indianapolis, Ind.; *Kansas City, Mo.; *Los Angeles, Calif.; Minneapolis, Minn.; *Newark, N.J.; *Portland, Ore.; Rogers Station, Philadelphia, Pa.; Rochester, N.Y.; *Saint Louis, Mo.; *San Diego, California; *San Francisco, California

EXPORT SALES OFFICE—LIONEL-ESSEX INTERNATIONAL CORPORATION, 15 E. 26th ST., NEW YORK 10, N.Y.

ELECTRICAL WIRES AND CABLES *"BETTER THAN CODE REQUIRES"*

IT'S EASY TO SELL Stab-lok® TO BUILDERS

(gives them a big sales point, for pennies)

ALL OVER THE COUNTRY, builders are the biggest prospects for Stab-lok Circuit Breakers. They buy Stab-loks like hot cakes because they're convinced that modern circuit protection is a really important sales point with prospective home buyers. And, of course, Stab-loks cost only pennies more than fuse boxes... and across-the-board cost less than other circuit breakers when you buy them; less to install; less when you change or add circuits.

And look at these other *exclusive* Stab-lok features:

Absolute dependability—More Stab-loks are being installed today than all other circuit breakers put together... they're the only breakers service-proven in millions of homes.

Most complete line—Stab-lok with widest range of enclosures meets every reasonable specification for circuit protection, easily, without fuss or bother.

Most flexible—Stab-lok Magic "E" and sequenced bussing, PLUS the standard, single pole NA, the new thin NC and the double pole (simultaneous trip) breakers, provide flexibility unapproached by any other system.

Most distributors—Stab-lok distribution is completely tops; breakers and enclosures are delivered promptly—everywhere.

Sure, keep after the smaller prospects for Stab-lok—they all add up. But go after builders, too, and sales will *multiply*. And write for the Magic "E" booklet giving latest Stab-lok facts. Federal Electric Products Company, 50 Paris Street, Newark 5, N. J.

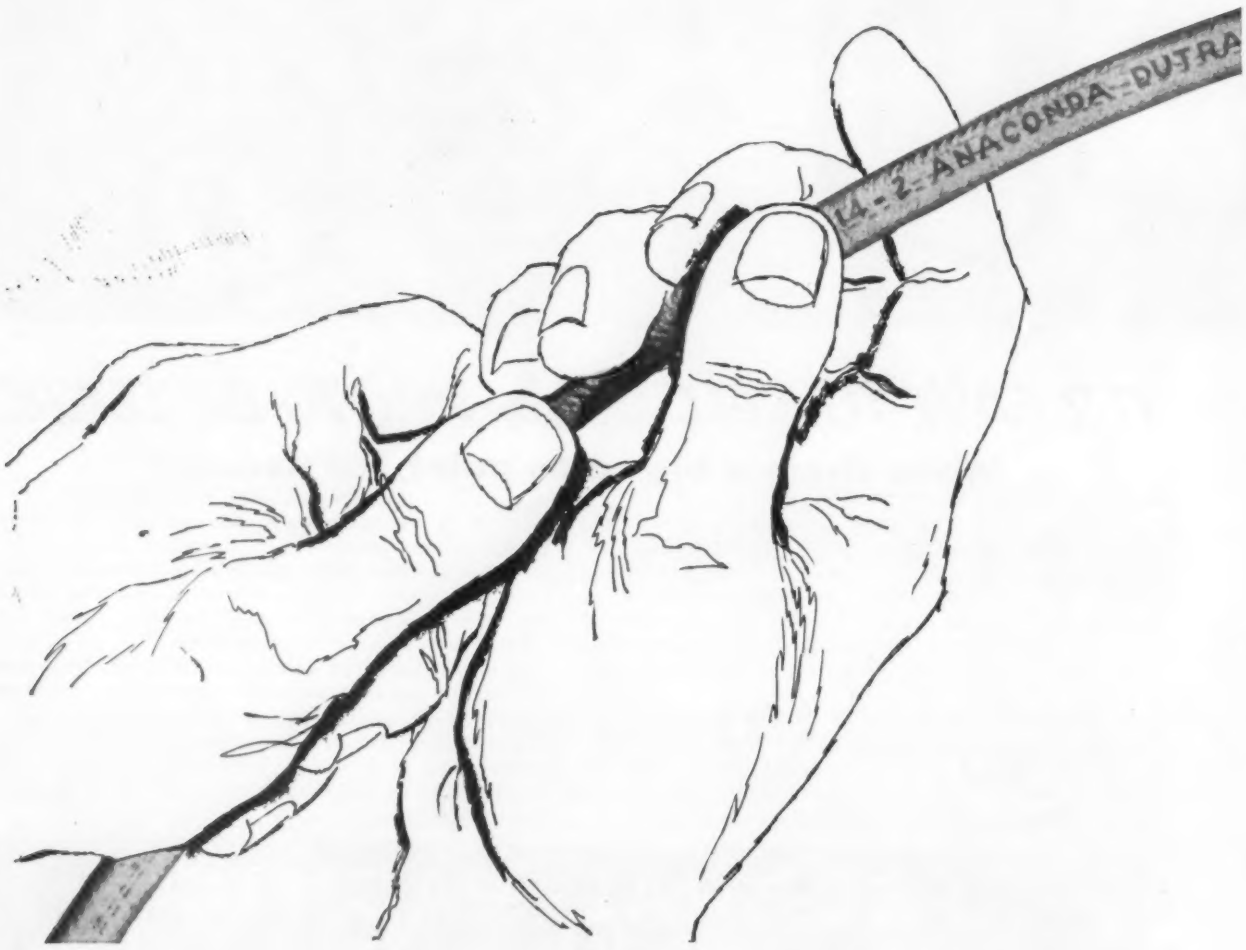
FEDERAL & PACIFIC

ELECTRIC PRODUCTS COMPANY — ELECTRIC MANUFACTURING CORP.

Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct—**Pacific Electric products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

Introducing Anaconda

Improved finish on this new Type NM (nonmetallic-sheathed) cable makes it the cleanest, fastest-working building wire today!

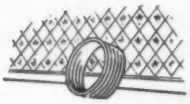


SILVER Dutrax cable

★ You can fish it through joists with *half*—yes, half—the effort required by ordinary nonmetallic building wire.

★ It's clean to handle . . . won't flake or peel.

★ Silver Dutrax® speeds your work. It won't become sticky.



★ Silver Dutrax won't soil your hands . . . lessens chances of marring walls.

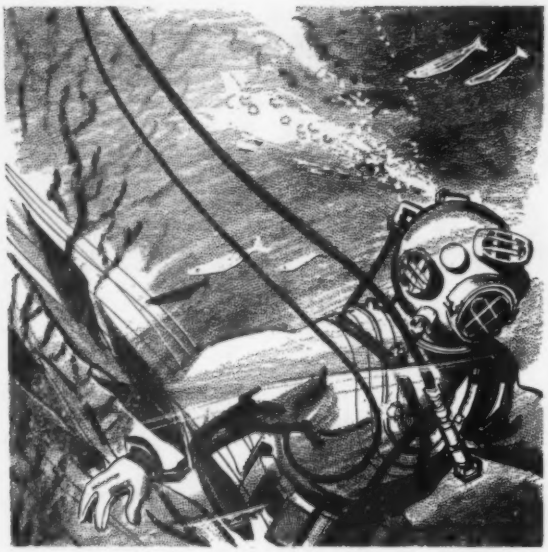
✻ Ask your Anaconda Representative for sample and full information.
Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

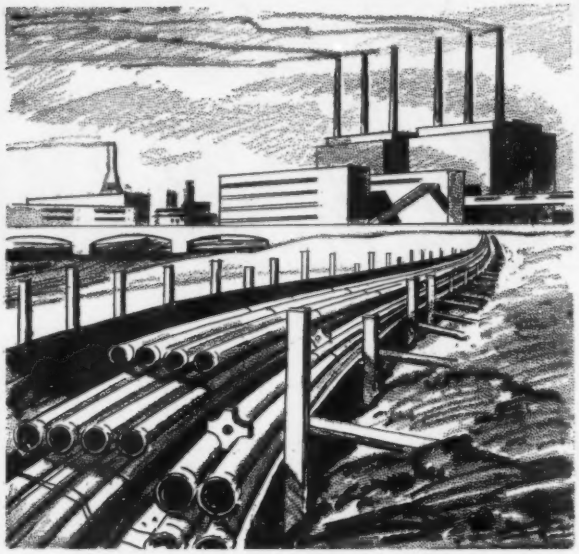
54459

the right cable for the job

ANACONDA® WIRE AND CABLE

LIFE LINES





Oxygen lines are the life lines of every diver!

Electric cables are the life lines of every community!

Orangeburg Fibre Conduit gives cables complete underground protection!

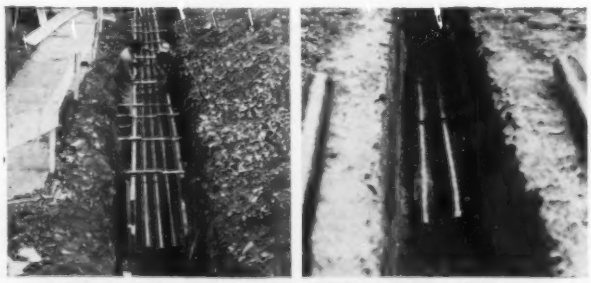
ELECTRICAL CABLES...the *life lines* through which power flows into every community's homes, offices and plants...must have the fullest and the longest protection possible. And that is what they get in the underground ducts with Orangeburg Fibre Conduit.

This is a fact so well understood throughout the electrical industry that Orangeburg Fibre Conduit is a first choice of Public Utilities, Municipalities, Industries and Electrical Contractors everywhere.

The reasons for Orangeburg's High Quality! Tough, strong, resilient, non-metallic...Orangeburg Fibre Conduit does not crack or break. Its impermeable walls and tight joints bar out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion while *going in* and *after they are in* the duct. Orangeburg material resists acids, alkalies, salt, grease, oil. The net result: a *longer-lived* raceway for *longer* cable life.

Check these cost-saving advantages...Light weight ... long lengths ... readily assembled joints ... angle couplings, bends and other Orangeburg standard fittings ... these are some of the reasons why Orangeburg Fibre Conduit is so quick, easy and economical to install. Send to Dept. EC54 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, NEW YORK
West Coast Plant, Newark, Calif.



ORANGEBURG FIBRE CONDUIT

STANDARD with concrete encasement **NOCRETE** without concrete encasement

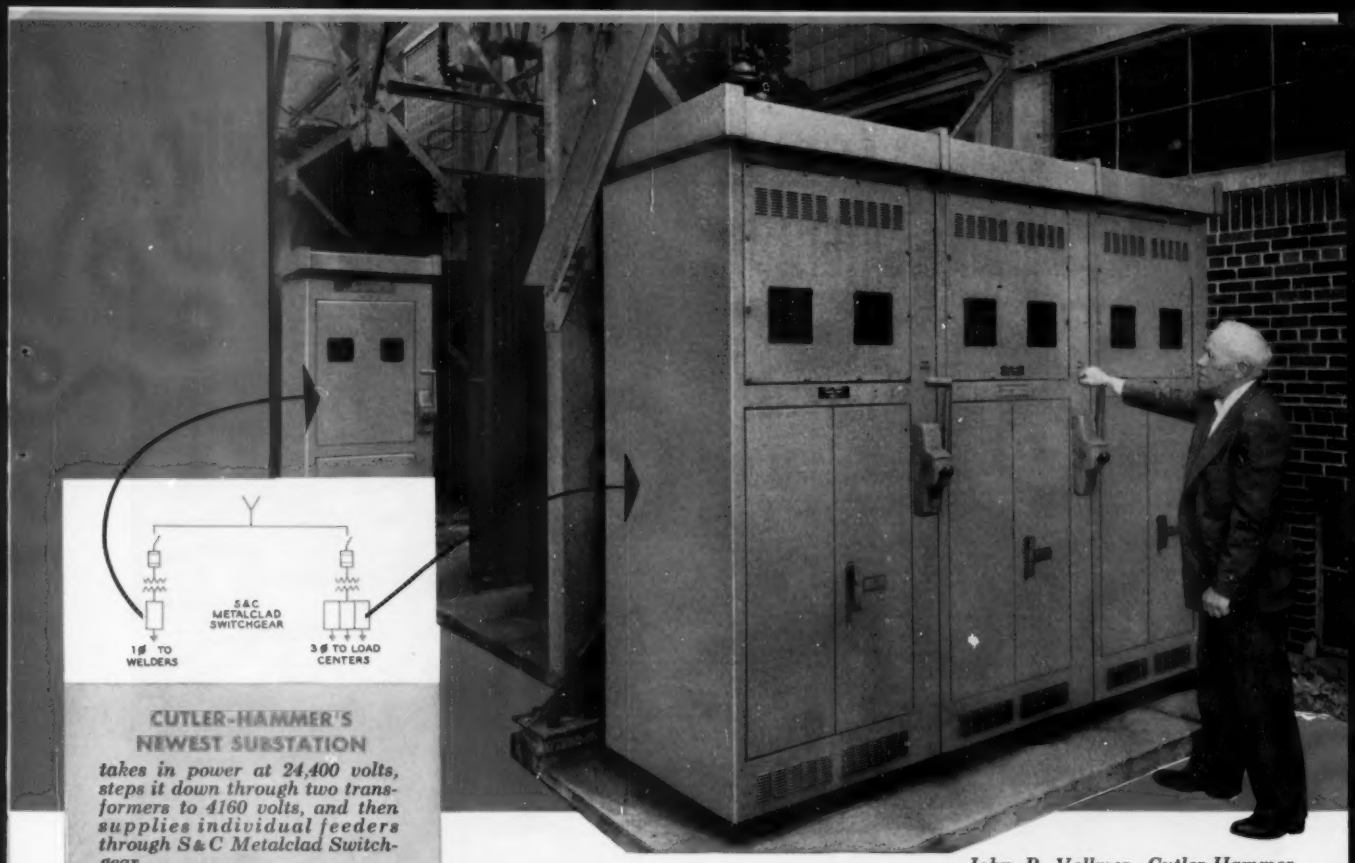
GraybaR ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY

A Division of General Electric Distributing Corporation



CUTLER-HAMMER'S NEWEST SUBSTATION

takes in power at 24,400 volts, steps it down through two transformers to 4160 volts, and then supplies individual feeders through S&C Metalclad Switchgear.

John P. Vollmer, Cutler-Hammer chief plant electrician, at the main substation

SAVES 50%

BY SELECTING S&C METALCLAD SWITCHGEAR

To protect and switch high voltage feeders at the main substations

MR. CHARLES WELCH

is plant engineer for Cutler-Hammer, in charge of five plants including the newest at 30th Street, Milwaukee. He says "S&C meets our standard of quality, and we haven't had a single failure of S&C equipment since we first started using it back in 1938. The S&C Switchgear we selected for the new plant fits our needs exactly."

Charles Welch, Cutler-Hammer's chief plant engineer, cut equipment cost in half when he selected S&C Metalclad Switchgear for Cutler-Hammer's newest Milwaukee plant.

A 15-year record of *no failures* in four other plants proved conclusively that this S&C gear would meet the most rigid service requirements in the new plant. Today, heavy production schedules are maintained without interruption of power, and S&C gear continues its unfailing record.

You, too, can make savings of this kind and meet your requirements exactly by specifying S&C Metalclad Switchgear. Full information is contained in this booklet. We would like to send a copy to you.

S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

The answer to complete lighting flexibility

Fluorescent lighting on Universal Trol-E-Duct installation at Ford Motor Company's Buffalo Stamping Plant, Hamburg, New York

FORD MOTOR USES TROL-E-DUCT® —6¼ MILES OF IT!

BullDog Universal Trol-E-Duct lets Ford add, move or remove lights anywhere, anytime, without rewiring. Here's true flexibility that meets any requirement from a fixture change to a completely new floor layout.

Every rugged inch of durable BullDog Trol-E-Duct provides available easy-to-tap current. Simply slip twistout plug into continuous slot—instantly you get a positive connection without disrupting power. What's more, the 50-ampere rating of the copper bars assures ample provision for future growth.

Prefabricated duct sections install easily, quickly with only a screw driver. Can be dismantled and installed elsewhere, with never a wasted part.

For the answer to your lighting problem, check with your local BullDog Field Engineer. Or write for free bulletin UT-650. BullDog Electric Products Company, Dept. EC-54, Detroit 32, Michigan.

©REPCO

BULLDOG
ELECTRIC PRODUCTS COMPANY

Washington Report

New building construction remains one of the nation's strongest economic factors, keeps Administration officals optimistic. First quarter total of $7.3 billion expenditures exceeded 1953's first quarter by 1.5%, set a new record for this period. March's $2.5 billion outlay reflected expansion on private housing and public utility construction, plus gains in highway work, Depts. of Labor and Commerce reported.

Private industrial building was $172 million, down only 2.8% from February, is expected to remain high over next four years for plant and equipment spending (See page 101). Commercial building lagged behind usual upturn for this period, at $156 million.

First quarter housing starts were 236,000, with public housing starts down, private housing totals increasing. In March public housing starts were 1,200 compared with 9,700 a year earlier. Private funds accounted for 95,800 starts in March compared with 96,100 last year.

Cost of living dropped in March by 0.2%, and is expected to decline further, BLS reported. Effect of reduction of excise taxes April 1st may produce a further drop of 0.5% to 0.7% in the BLS Index, which at mid-March was 114.8% based on the 1947–49 average of 100 as a yardstick. Wholesale prices have firmed, many have edged up in recent weeks, BLS said, reflecting stability ahead.

Personal income to individuals in February were at annual rate of $282.9 billion—$1.9 billion above a year earlier, Dept. of Commerce reported. Record high was in July 1953, at $287.5-billion rate.

Employment holds high, in spite of reports on rising unemployment which reflects both job losers and labor force additions. Unemployment gains have declined, but may rise sharply in June, reflecting big rise in labor force as boys and girls come out of schools. Unemployment in June is predicted at about 4.5 million.

Consumer spending picked up at Easter, has maintained healthy pace only slightly below year ago. Consumers have about $200 billion in liquid savings, which keeps Washington officials optimistic.

Metals stockpiling ordered late in March by President Eisenhower was expected to help U. S. mining industry, as well as increase stockpile for defense. Mining officials later urged restrictions on imports of foreign metals, which they claimed would offer protection to U. S. mines, prevent U. S. Government from buying world's excess production. Lead and zinc prices promptly increased, copper steadied at 30¢ per lb. Chile copper mines cut production in March an estimated 30% average. U. S. Government has since agreed to purchase 100,000 tons of Chile's large surplus. Aluminum output is now running near peak record of 116,247 tons achieved in January. Steel output, still down about 25% from same period last year, has firmed at about 70% of capacity, shows signs of picking up slowly.

Electric power output rate of gain over corresponding weeks of 1953 are diminishing, although 1st quarter output was 6% ahead of 1953 period. For week ended April 17 output was 8.345-billion kwhr, 2.9% over 1953's corresponding week. Average weekly production in 1946 was 4.238-billion kwhr. Biggest declines are in industrial areas, while individual power company gains up to 16% have occurred in Southeastern and South Central states.

Number of customers hooked up to electric power and light distribution lines reached 50 million in February, with an estimated 98% of nation's population connected for electrical service.

PITTSBURGH STANDARD *the only* GALVANIZED THREADS ON HOT-DIP GALVANIZED CONDUIT

say goodbye

TO THREAD RUSTING WORRIES

Here's goodbye to the rusting of threads on hot-dip galvanized conduit... goodbye to rusting in storage ... goodbye to time and money-consuming thread-cleaning on the job.

Hot-dip galvanized conduit with galvanized threads is the first bonus for you from the extraordinary new Pittsburgh Standard Morrisville Plant* —the world's most modern conduit mill.

Only Pittsburgh Standard offers this major bonus to you—and at no increase in price. Here's another reason why Pittsburgh Standard Hot-Dip Galvanized Conduit is "Standard of the Trade."

**Galvanized threads on all sizes from Morrisville, and on sizes 2½-in. and larger from Etna.*

Famous "Standard of the Trade" Products

RIGID STEEL CONDUIT
All Finishes

ELECTRICAL METALLIC TUBING

ELBOWS · COUPLINGS · FITTINGS

PITTSBURGH STANDARD CONDUIT CO.

WHOLESALERS IN PRINCIPAL CITIES

Need immediate information on which to base bidding estimates and work schedules? Ask your Pittsburgh Standard agent. The unique Pittsburgh Standard Sales Control Center will enable him to give you immediate facts. Guesswork is eliminated and you're days and dollars ahead.

61 BRIDGE ST. PITTSBURGH 23, PA. PLANTS AT MORRISVILLE & ETNA, PA.

MAY . . . . at a Glance

NISA TO DETROIT—Members of the National Industrial Service Association will be heading for their annual convention next month. The sessions are scheduled for the Hotel Statler in Detroit, June 13-17 and will be under the direction of C. J. Cannon, convention chairman and R. B. Turner, program chairman.

Besides the conference program and equipment exhibits, Detroit shops will carry on the tradition of "open house" to the delegates who will be able to visit and see at first hand the shop layouts and equipment that serve the great automotive capital.

For a preview of some of the things to look for, Middle West Editor August Eckel with the cooperation of the Detroit shops has prepared a pictorial roundup, which is presented as "Detroit Motor Shop Techniques" beginning on page 83.

CENTRAL CONTROL FOR AIR CONDITIONERS—Low voltage remote control switching has been used by Ling Electric Co., New Orleans, in an eight-story addition to the Louisiana State University Medical Building to provide central switching of individual air conditioning units throughout the building. The job presents a significant new use for this versatile control system.

Local control and operation of the individual units was retained with duplicate control centered in a basement equipment room under the supervision of the building engineer. Thus unattended units can be switched off at night and on again in the morning before office occupants arrive.

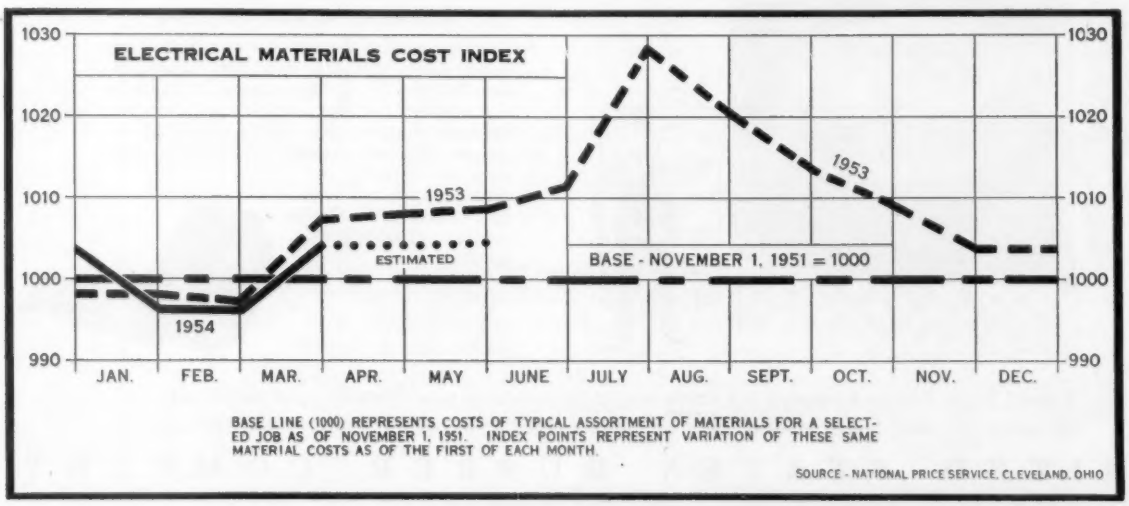
Details of the circuitry and the installation are presented in "L-V Switching Solves Control Problem", page 104, by Mario G. Zervigon.

NEW PLANT AND EQUIPMENT—Business plans for new facilities, expansion and modernization are a vital measure of the economic scene. They also provide an index to future opportunities in electrical work because such plans invariable include an important fraction which involves the goods and services of our industry.

For seven successive years, the McGraw-Hill Department of Economics has been conducting a revealing study on plans for capital expenditure. The report on the latest study projecting the next four years is presented in this issue. See "Survey of Industry's Plans for New Plants and equipment", page 101.

MULTI-BUILDING SCHOOL WIRING—The multi-building school, growing in popularity in the South and West, presents many new problems of distribution and electrical layout. Typical of this new construction is the eight building, one level project for the Burlingame Intermediate School at Burlingame, California. Emil J. Weber Electric Co., San Francisco, handled the 480-volt distribution system serving load centers providing utilization voltage to the several buildings. James L. Dellor, engineer for the electrical contractor, describes the installation and application details in "Modern School Wiring" on page 114.

SPACE HEAT—Electric space heating in the St. Louis area got a big lift from the Union Electric Co. recently in a series of meetings conducted with electrical contractors, wholesalers and electric heating equipment representatives. Emphasis was on sound development of the market, one which has an enormous potential over the country. The St. Louis activity is one of the first electrical industry efforts to develop appreciation and use of electric space heating with utility encouragement. See facts about electric space heating, page 95.



BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO

For top maintenance—depend on "U. S." Tape!

FRICTION, RUBBER and PLASTIC

SECURITY® FRICTION TAPE

For electrical and general purpose jobs. This is the strong, tacky tape that really grips and stays on. The fabric has unusually high tensile strength to handle tough jobs. Straight-tearing, non-ravelling. No pinholes to cause leaks. Rely on Security to stay on. Available also in specification grade—U.S. Holdtite®—exceeds A.S.T.M. specifications.

SECURITY RUBBER TAPE

For all general electrical work. This unvulcanized rubber splicing compound has the necessary physical properties: tensile strength, elongation, tackiness, plus the dielectric strength needed for durable splices. It is easy to handle and will fuse into a solid mass without heat or undue pressure. Available also in a specification grade—U.S. Holdtite—exceeds A.S.T.M. specifications.

ROYALASTIC PLASTIC TAPE

Does the work of both rubber and friction tape in many uses. This is the tape many maintenance men find best for making a thin splice and keeping wiring neat and uncluttered. Complete mechanical and electrical protection. High tensile strength and excellent resistance to abrasion and to water, oils, acids, alkalies and corrosive chemicals. Good stretch... clings tightly... strips cleanly.

United States Rubber Company is a single source for industrial tape. Simplify your purchasing by using one line. See your distributor or contact any one of our 25 District Sales Offices.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

53rd Year—MAY • 1954

Encourage Unit Cooling

To the electrical industry the growth of air conditioning is a happy outlook with built in benefits. In a typical office or store conventional wiring design provides about 2 watts per square foot. Air conditioning takes 3 to 6 watts per square foot more. That means a lot of new wiring and new opportunity.

Some folks are predicting that this is "the year of the big headache" in unit air conditioning sales. Forecasted sales will connect about 2 million kilowatts of extra load on already overburdened interior wiring systems. Electrical contractors everywhere will be busy trying to bail out customers who bought equipment from dealers who dodged this responsibility.

Traditional air conditioning, however, is a well established, vigorous, growing business. To that trade, electric wiring is an optional nuisance. A central plant can operate on oil, gas or steam. Many air conditioning people see the current excitement over window air conditioners as a temporary phenomenon which inevitably will build acceptance and demand for complete systems. And these systems will be traditional central plants with air or refrigerant distribution and water condensing.

We'll go along with one aspect of the traditional view. The window mounted cooler is a pilot device which will build acceptance and demand for superior equipment and performance. Beyond that, air conditioning can and must proceed in the direction of local unit equipments employing electrical energy distribution.

Noise, poor application, clumsy appearance, temporary window sill mounting and high air velocities are all tolerable deficiencies for the early stages of unit development. They are far outweighed by immediate benefits. But they must not be allowed to persist until they become accepted as characteristic of unit equipment and application.

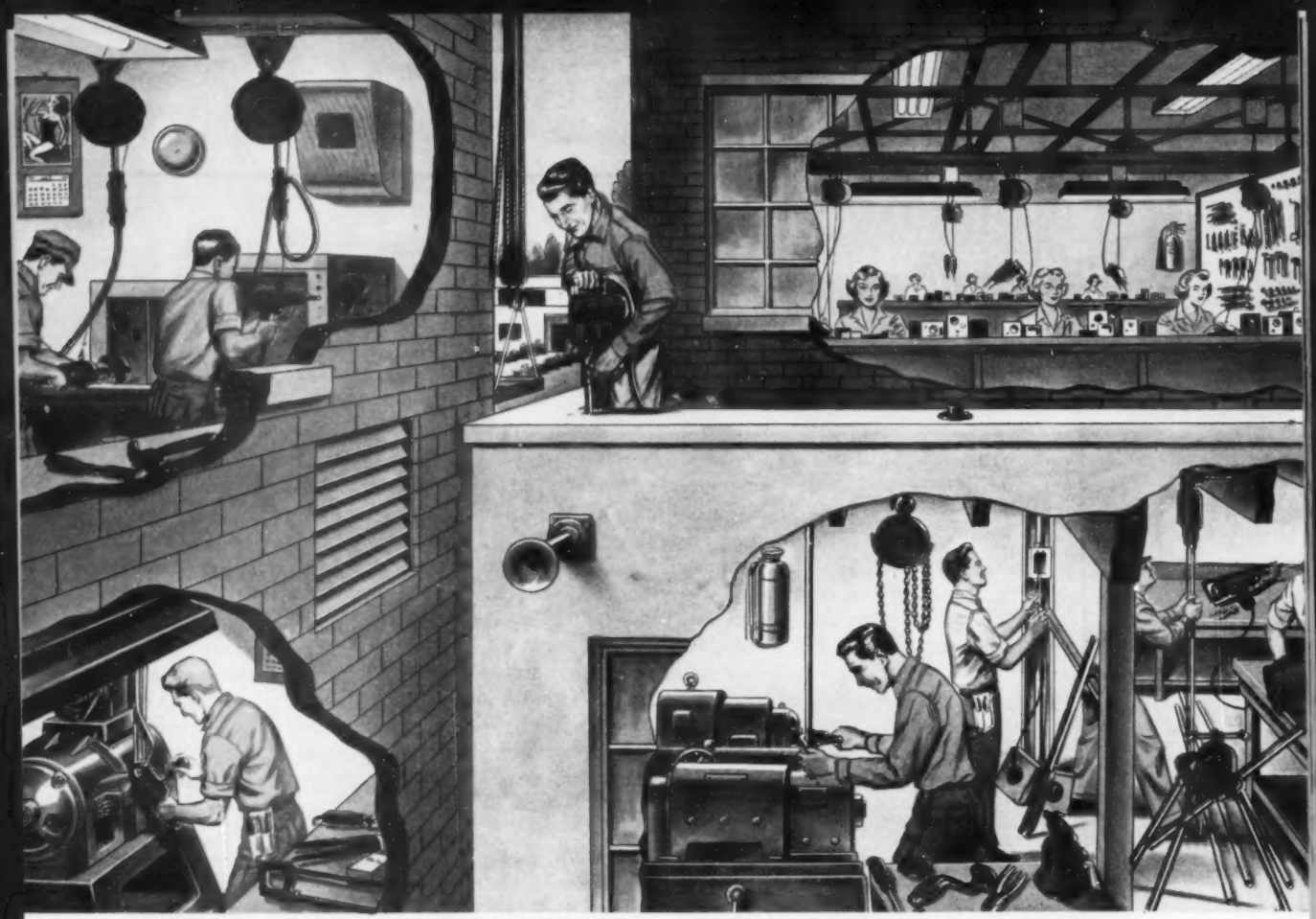
Indiscriminate marketing and plug-in-and-run installation are hell-bent to give unit cooling a bad name at a time when public attitudes are forming. Another year or two of this kind of selling and unit cooling will be firmly established as a second rate way of doing the job; a poor substitute for central cooling.

The room cooler has many shortcomings today. But it is the prototype in function of a new and highly desirable approach to systematic air conditioning using the flexibility and efficiency of electrical distribution as an essential part of its operation.

Actually, unit equipments present a concentration of a vast and complicated technology in a small box. Unit air-to-air equipment is a one-craft installation, within the scope of the primary competence of the electrical contractor. No custodial care or operation is required. Maintenance is routine. Repair is simple site replacement and shop bench or factory rebuilding of components. And all these are becoming important criteria in system selection and design.

Passive participation is not enough. The electrical contractor should move in at this critical time to 1) give support and encouragement to those manufacturers who are developing superior unit equipment for permanent installation and 2) give support and cooperation to those manufacturers who have chosen to market their products through competent and responsible electrical industry channels.

Wm. T. Stuart



GRAYBAR CAN SUPPLY VIRTUALLY ANY PORTABLE ELECTRICAL TOOL needed for plant production line, construction, or maintenance work. Just call your local Graybar Representative or nearby Graybar office or warehouse. They'll provide prompt, accurate price and specification data on tools as well as any of your other electrical needs.

The right tools get the job done faster

FREE . . . Graybar Tool Catalog

64 pages of price and ordering information make this one of the most comprehensive tool catalogs ever published. Hand tools, motor-driven tools, and miscellaneous supplies for every electrical construction or maintenance need are listed. Write, today, for your free copy.

Better tools make better workers . . . work goes faster, and more smoothly with quality tools built for the job.

Check your tool inventory, today – then order the hand or portable power tools you need . . . via Graybar.

For, as with all of your electrical needs, Graybar offers a specialized service in their procurement.

- **Well-known makes** – of proved design and construction for hard usage.
- **Availability** – via more than 110 strategically-located Graybar offices and warehouses.
- **One source . . . one responsibility** – through centralization of all order assembly, shipping, and billing functions.
- **Graybar Specialists** – men with years of experience in all of the major electrical fields to advise and consult with you and your customers.
- **Everything Electrical** – for plant maintenance and construction. Over 100,000 items . . . the products of over 300 leading manufacturers.

CALL GRAYBAR FIRST FOR...

GraybaR Everything Electrical

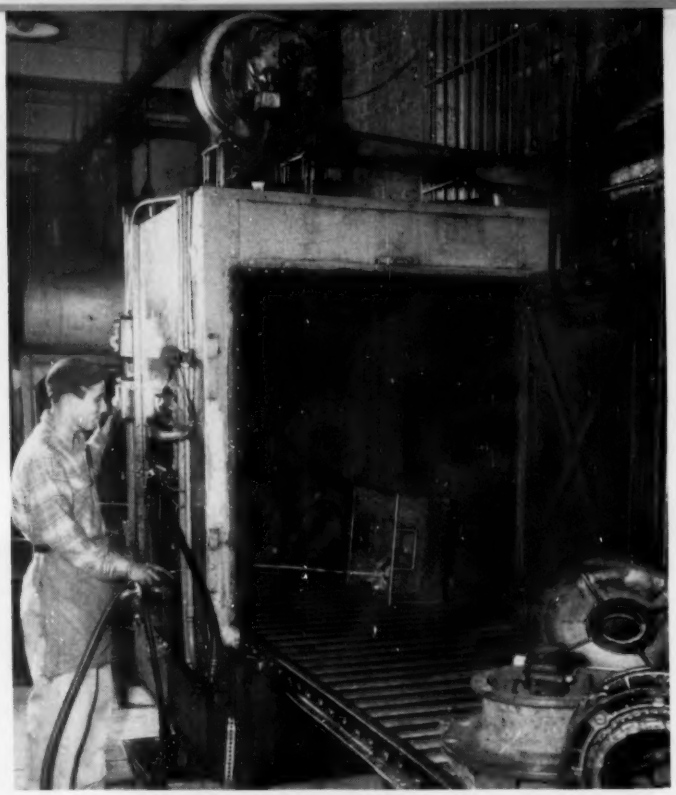
IN OVER 110 PRINCIPAL CITIES

GraybaR **ELECTRIC CO., INC.**
420 Lexington Ave., New York 17, N. Y.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Vol. 53 No. 5

Shop visits offer delegates chance to see ideas developed by repair specialists to improve workmanship and customer service in Motor City area.



SPRAY BOOTH STRADDLES feeder conveyor at Spaulding Electric Company. Gasketed doors on each side of 4-ft. by 4-ft. by 4½-ft. steel booth are closed during spraying operation. Operator views work through 19-in. by 9-in. glass window. Solvent is reused after going through series of dirt traps and filters. Socket wrenches are racked on conveyor.

See These DETROIT Motor Shop Techniques

while attending the NISA Convention next month.

THE 21st National Convention of the National Industrial Service Association at the Hotel Statler in Detroit, June 13-17 will be another working conference for hundreds of motor repair shop operators from all over the United States and Canada. Convention chairman C. J. Cannon (Nimmo Electric Co., Detroit) and program chairman Robert B. Turner (Johnson-Turner Electric Repair & Engineering Co., Windsor, Ontario) have organized a well-rounded agenda of meetings, conferences and product exhibits designed to keep delegates busy.

Morning sessions will be on a more formal plane with prepared papers by industry leaders on technical subjects of repair techniques and shop operation as well as a host of management problems encountered in the conduct of a motor shop business. A forum discussion of morning subjects is scheduled for each afternoon with authors of papers present to answer questions and contribute to an exchange of pertinent shop information. Product and equipment exhibits will supplement these sessions and present the latest in material developments for better repairs and more efficient operation.

Shop men will get from this trip just what they came for—a host of new ideas and techniques which they can use to advantage in their own specific operations. Many will venture beyond the confines of the convention headquarters—as they have in the past—to visit local motor shops in action and compare what they see with what they have at home. This brand of honest inquisitiveness combined with a wholehearted exchange of practical information is a basic ingredient of NISA's success as an organization.

That is why a number of Detroit shops will hold open house during the convention. The welcome mat will be out for delegates to come and discuss general or individual problems, to see "how the other fellow does it." What they will see will be a number of varied techniques developed by Detroit shop specialists to better serve the multi-million dollar electrical equipment repair market in the automotive capital. Individually, these methods enable each shop to do a better job from a business and technical standpoint. Collectively, they raise the status of electric motor repair shops as a customer service industry covering maintenance, repair and design.

The following sequence of photographs presents a preview of just a small part of the facilities Detroit shops have to serve their customers. Much more awaits delegates who prefer to spend leisure time visiting shops and "talking shop" whenever opportunity permits. The solution to a specific problem may well lie in just such a visit. Detroit repair specialists hope visitors will come and compare notes.

NISA CONVENTION PROGRAM SUBJECTS

TECHNICAL

The NEMA Frame Re-rating Program
Single-Phase Motor Shops

- Rewinding techniques
- Shop layout and equipment
- Special tools and devices
- Statistical information

New Insulating Materials and Their Applications
Applications, Servicing and Repair of Ball Bearings
Electrical Testing Methods
Commutator Repairing and Techniques
Efficiency Ideas for Repair Shops

BUSINESS MANAGEMENT

Sales Promotion
Salesmanship
Customer Relations
Profit Control
Incentive Plans
Legal Problems

DIP TANK GAUGE painted on outside of tanks at Howard Electric Company permits quick estimate of varnish content, eliminating guessing when adding solvent. Small tank is for silicone varnish.

PLENTY OF SHELF and cabinet space easily accessible to mechanics is feature of remodeled parts storage department at Howard Electric Company. Each bin carries contents identification.

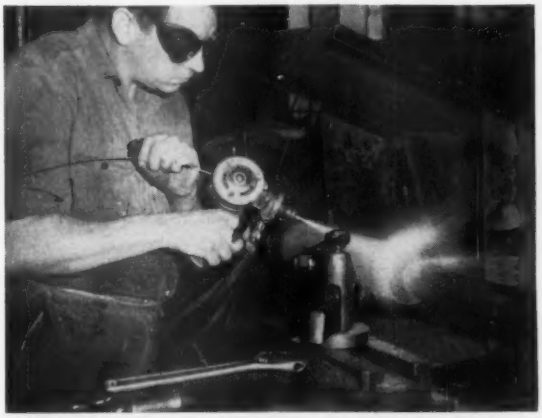
DEGREASER TANK comes in handy for cleaning numerous types of equipment before reassembly at Howard Electric Company. Overhead chain hoist system is used extensively for material handling throughout the shop.

FORK LIFT TRUCK of one-ton capacity solves equipment handling problems at Don Blackburn & Company. Unit lifts motors and other heavy equipment either on pallet or with supporting bar through frame eye or sling.

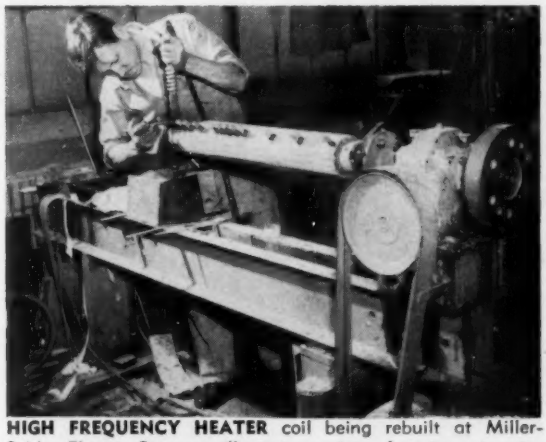
COMPACT INSULATION STORAGE cabinet holds all necessary items at Don Blackburn & Company. Tilted tubes at left and wire mesh troughs at right and top hold tubing and slot wedges. Sheet mica and flat insulation is in drawers.

DIPPING AT Don Blackburn & Company is done in a 5-ft. by 5-ft. by 9-ft. cinder block room with cellular steel roof covered with 4 inches of sand. Room has forced air ventilation and fiber-glass vent in door. Impregnated units are shifted to 7-kw bake oven at right.

MOTOR CONTROL DISPLAY boards at Spaulding Electric Company help customers choose units to fit specific dimensional limits of mounting facilities, leading to on-the-spot resolution of control problems. Three 3-ft. by 8-ft. fiber peg boards comprise the display.



METAL SPRAYING IS USED in a number of Detroit shops for shaft repairs. Here, stainless steel is being sprayed on a pump shaft at Spaulding Electric Company to build shaft up to proper diameter.



HIGH FREQUENCY HEATER coil being rebuilt at Miller-Seldon Electric Company illustrates variety of equipment motor shops repair. This 800-volt, 3,000-cycle, water-cooled induction heater for billets is being rewound with copper tubing.

CONVEYORS SPEED HANDLING of repairs at Spaulding Electric Company. Here, finished motors are being pushed through sliding door to conveyor apron on loading dock. Same 36-in. wide roller conveyor leads to disassembly area.

SAND BLAST ROOM at Howard Electric Company accommodates small equipment on rolling tables or large stators on low dollies. Metal booth (36-in. by 66-in. by 78-in.) has 48-in. by 12-in. tilted viewing window for operator.

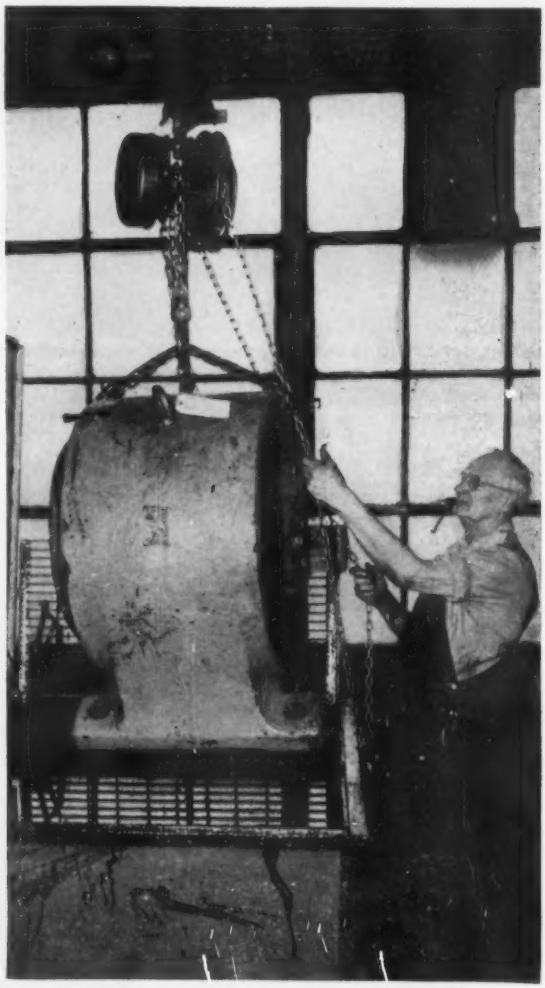
ONCE OVER LIGHTLY with a No. 16 aluminum oxide sanding drum on ¾-hp flexible shaft grinder quickly and efficiently removes insulating varnish film on stator laminations at Don Blackburn & Company.

COMMUTATOR UNDERCUTTING of large rotors may not be done on lathes of conventional sizes. Howard Electric Company uses a portable attachment which fastens to the lathe bed and is driven by the lathe motor. Attachment brings the cutting tool out beyond the normal working diameter of the lathe tool, permitting the accommodation of sizeable rotors.

GAS FIRED BURNOUT oven at Howard Electric Company incinerates windings at about 500° F, then shuts off automatically for gradual cooling. Firebrick lined unit is 3-ft. by 4-ft. by 5-ft.

TOTE BOX DISTRIBUTION of repair work to individual work benches is a method used in the motor repair department and manufacturing areas of Jay Electric Company.

PART OF HUGE STOCK of motors and transformers for resale at J. E. Berger Corporation are stored outdoors in an orderly arrangement. Warehouse facilities are adequate for smaller stock, but larger equipment such as these induction motors are of necessity kept outside. Pallets and slings are available for easy moving or loading by fork lift trucks.

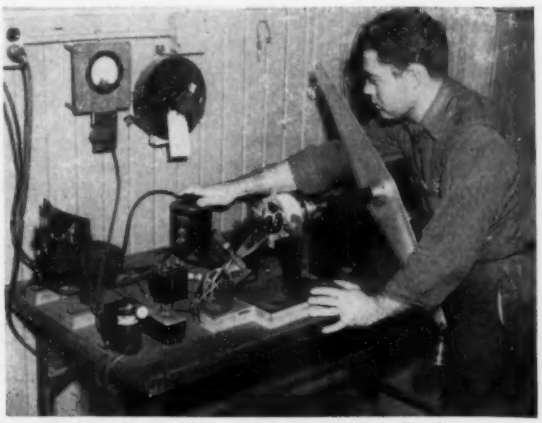


V-SHAPED DIP TANK with 236 gallons of insulating varnish is ready for a 150-hp, 1800-rpm stator at Miller-Seldon Electric Company. Unique tank design keeps varnish in better condition, since amount in tank is more in ratio to amount used, according to C. R. Medsker, manager. Tank has self-contained counter-balance and fuse-link cover fire release.

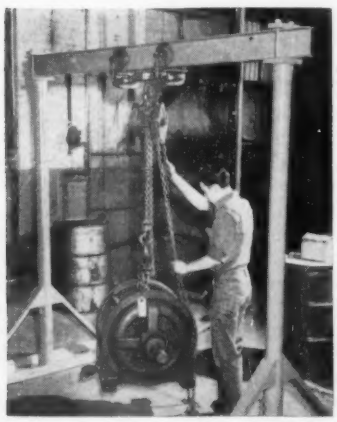
ROTATING JOB TICKET RACK in partition between foreman and shop office facilitates job cost accounting at Miller-Seldon Electric Co. Entries may be made by girl or foreman without leaving desk.

ADEQUATE STOCKS OF replacement parts is an important phase of motor shop service. This parts department at Jay Electric Company includes a variety of housings, gears, controls and other items for electric hoists as well as a representative supply of parts for the many varieties of motors that pass through the shop for repair. All items are stored in appropriate positions on stock shelves.

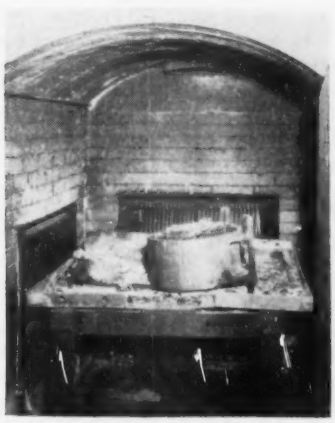
PART OF PORTABLE INSTRUMENT stock maintained by Spaulding Electric Company runs from gauss meter to strobotac, cathode ray oscilloscope to newest hand tachometer held by George Glenning in charge of repair operations.



DIVERSITY IS A RULE with most motor repair shops. Here a mechanic at Jay Electric Company is running a torque test on a step-by-step repeater motor manufactured by the Jay company as an adjunct to its repair activities.



HEAVY DUTY PORTABLE A-FRAME built by Spaulding Electric Company for field use consists of six parts: two 12-in. channel bases; two 3½-in. conduit uprights; 6-in. I-beam crosspiece; 1-ton chain hoist and trolley.



50 KW ELECTRIC BURNOUT oven at J. E. Berger Corp. operates at a temperature range up to 1000°F., has 18-inches of fire brick and fiber glass insulation so temperature from eight space heaters can be raised and lowered slowly.

ROLL-AWAY PARTS TABLE keeps coil winder supplied with accessories at Miller-Seldon Electric Company. Adjustable, multiple tension block on reel stand can be moved vertically or horizontally to align wire with winding head.

FROM POOR LIGHTING like this uncomfortable 5-footcandle condition in a typical classroom . . . .

TO GOOD LIGHTING with a minimum of 30 footcandles in

Canton's Program of

School Relighting and Rewiring

more than triples average classroom illumination in public schools. Long-range project involves fluorescent lighting, heavier services and feeders and more branch circuits.

By **R. L. Spring,** *president, Spring Electric Company, Canton, Ohio*

NEW FLUORESCENT lighting systems provide a minimum of 30 footcandles in the average public school classroom in Canton, Ohio. And new services, heavier feeders and more branch circuits permit this level to be upped to 45 footcandles, if desired, in the future. By the end of this year, all of Canton's 30 city school buildings will have gone through a complete electric rehabilitation.

Four years ago, these same classrooms had an average of 6 to 10 footcandles of incandescent lighting. In many schools, two or more rooms were fed by a single branch circuit, most had no convenience outlets and service and feeder capacity were woefully inadequate.

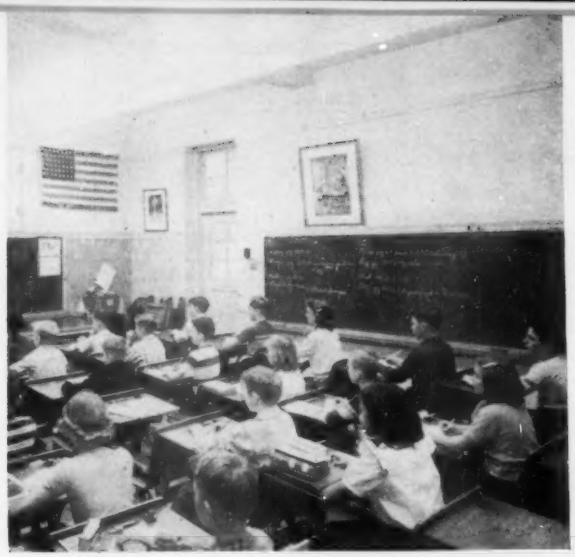
The transformation started in 1950 when Spring Electric Company, successful bidder on Canton Board of Education's first wiring contract, began work on the initial group of school buildings. In the interim, Spring competitively won additional contracts covering the long-range, $250,000 relighting program. Frease Electric Co. of Canton also was successful in securing a portion of the installation work.

Years of planning and detailed work preceded the first installation. School officials consulted with Ohio Power Company engineers, electrical contractors, and fixture manufacturers, made inspection trips to Nela Park and schools in other cities. Test installations were made in several Canton classrooms to determine type of fixture maintenance cost and other data.

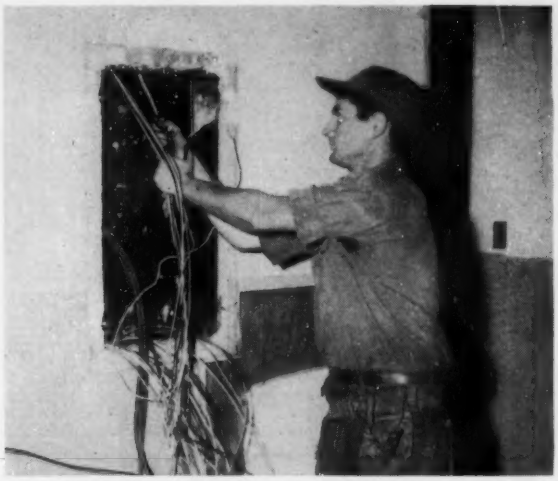
Most time-consuming of all were the complete electrical surveys made in each school. No plans of original installations were available. Each feeder and branch circuit was checked and traced, with the aid of a walkie-talkie set, to establish an engineering basis for the relighting and rewiring plans and specifications. Conduit sizes, panel box dimensions and other dimensional data were carefully noted so that as many of the existing facilities as possible could be reused. Collaborating in this and other related work were Steven Soldatis, supervisor of building operation and maintenance for the Canton Schools and John Wolf, power company engineer assigned to the project. When the estimated project cost was determined and a bond issue floated, the program proceeded under direction of Dr. Harold H. Eibling, superintendent of Canton City Schools, and Marion A. Conkle, director of business affairs.

New Lighting System

Previous engineering studies indicated that 2-lamp, 40-watt, louvered,

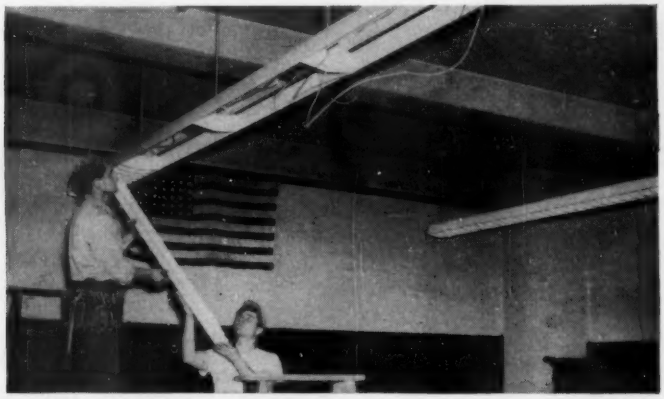


the same room is the transformation accomplished by the relighting program.



NEW BRANCH CIRCUIT conductors and feeders were pulled in existing conduits and panel cabinets wherever possible.

OLD FIXTURES like these drop cords with glass shades plus oversize lamps and enclosing globe units were replaced by . . . .

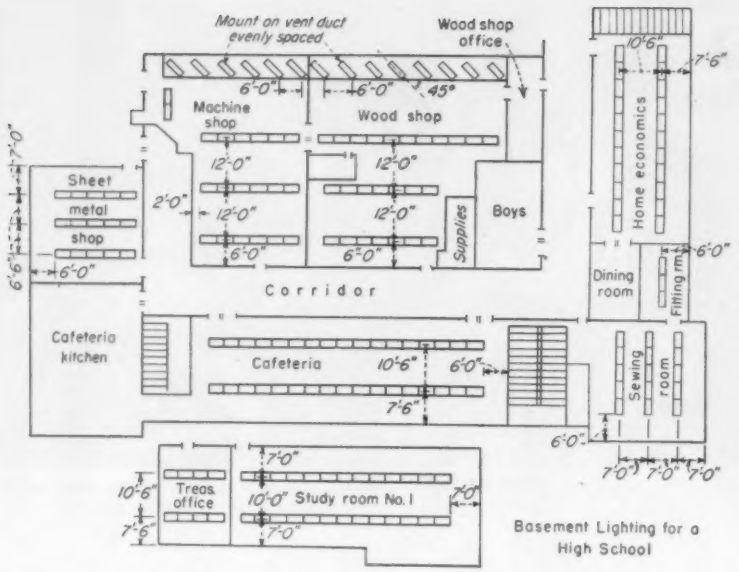


NEW FLUORESCENT UNITS of the two-lamp, louvered type mounted in parallel continuous rows. Units of similar design were standard for all school buildings.

SCHOOL: Allen Grade School **TYPICAL SURVEY REPORT** **January, 1950**

Room	Foot Candle Reads				Average Foot Candles	Pres. Load In Watts	Approx. Increase In Watts For 30 F.C. Min.	Remarks
First Gr.	9	4	14	10	9	400	1000	Readings taken at night or on dark days in November & December, 1949
Second Gr.	6	7	4	4	5	400	1000	
First Gr.	5	7	4	5	5	400	1000	All estimates based on fluorescent lamps using 40-watt, 48" T-12, 3500° white.
Fourth Gr.	7	9	6	7	7	400	1000	
Prim. Gr.	6	6	6	5	6	400	1000	All wattages approximate.
Fifth Gr.	8	10	11	8	10	400	1000	Service entrance changed to three phase, four wire 120/208v. Capacity OK.
Fifth Gr.	5	6	4	5	5	400	1000	
Eighth Gr.	7	5	9	7	7	400	1000	
Sixth Gr.	4	6	5	5	5	400	1000	
Sixth Gr.	10	9	8	6	8	400	1000	
Seventh Gr.	8	7	7	4	6	400	1000	
Third Gr.	5	5	7	4	5	400	1000	
Fourth Gr.	12	7	7	12	9	600	800	
Third Gr.	12	11	11	13	12	600	800	

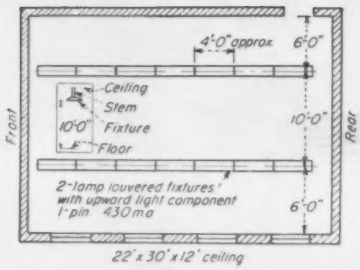
SURVEY REPORTS like this were made for each school in the Canton City School System; formed the basis of detailed plans and specifications covering relighting and rewiring the classrooms.



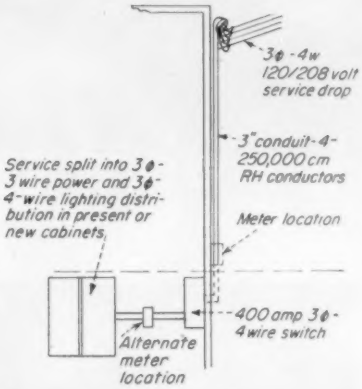
Basement Lighting for a High School

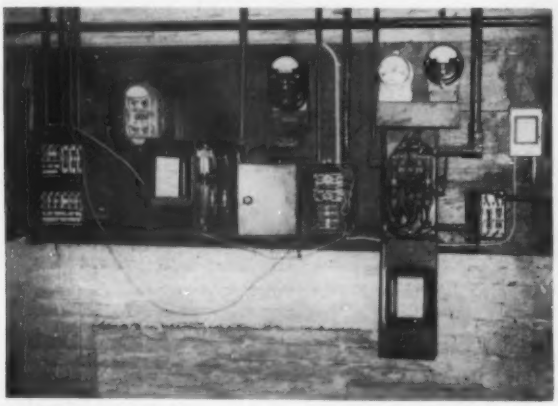
CONTINUOUS ROW PATTERN applied to all school rooms including shop and cafeteria areas like these in the basement of a relighted high school building.

NEW SERVICES of this 3-phase, 4-wire, 120/208-volt type replaced existing single-phase, 3-wire and 3-phase power services in almost all schools relighted.

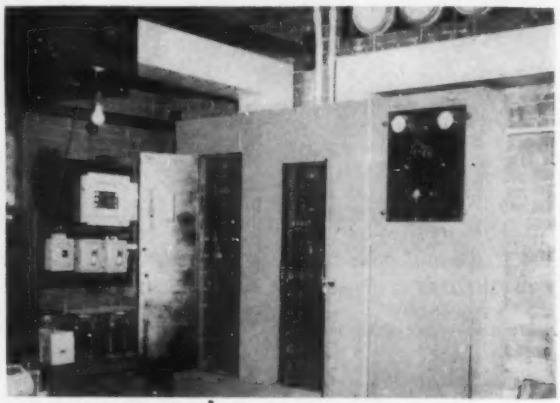


TYPICAL CLASSROOM RELIGHTING consisted of two continuous rows of fluorescent fixtures to secure 30 fc.


3φ-4w 120/208 volt service drop
3" conduit-4-250,000 cm RH conductors
Service split into 3φ-3 wire power and 3φ-4-wire lighting distribution in present or new cabinets
Meter location
400 amp 3φ-4 wire switch
Alternate meter location



EXISTING SERVICES and distribution of the fuse-block type (separate light and power) found in many of the buildings were torn out and replaced by . . . .



MODERN DEAD-FRONT fused disconnect or circuit breaker combination light and power panels on the new 3-phase, 4-wire services. This installation was made in a high school.

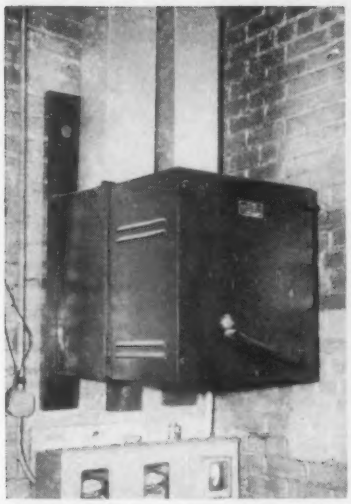
fluorescent fixtures mounted in two continuous rows would provide the desired 30-footcandle minimum per room and do the best job commensurate with reasonable cost. Units are either ceiling-mounted or stem-suspended depending upon room conditions. At least one wall switch is provided for each row of fixtures. Two No. 12 circuits serve each classroom, including new receptacles for visual education equipment. This general pattern applies to all schools. Among fixture units installed were Westinghouse and Sylvania single-pin type and Wakefield rapid start.

Some idea of the relighting program scope is given by these figures: Orders covering 18 buildings included 392 classrooms requiring 5,156 fluorescent fixtures. In addition, one high school auditorium was completely relighted with Guth silver-bowl units, and a new stage lighting dimmer board was installed.

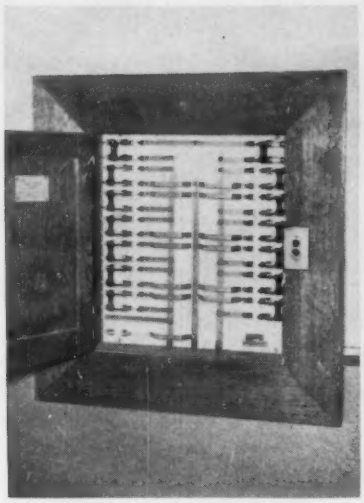
Rehabilitation of electrical systems to serve the new lighting was by far the most challenging—and most difficult—part of the project. To provide the necessary additional feeder capacity in existing conduits, the original single-phase, 3-wire systems were changed to 3-phase, 4-wire, 120/208-volt distribution. In almost all buildings, this meant complete new services ranging in size from 400 amperes to 3,000 amperes. In some schools wiring for electric cooking equipment in cafeterias and science rooms was included.

Wherever possible, existing branch circuit conduits were reused by replacing the old No. 14 duplex conductors with single-conductor, Type T wires. Where conduits were too small to carry the branch circuits, Wiremold extensions were installed.

In a majority of cases, new lighting distribution panels (of the fuse-switch or circuit breaker type) were mounted in existing cabinets or "tubs". Where cabinet depths were too shallow to accommodate the new panels, covers were ordered with a return flange to make up the dimensional difference.



SERVICE DISCONNECT on a high school project is provided by this 800-ampere 600-volt, 3-pole circuit breaker located in a boiler room.



OLD LIGHTING PANELS of the front-connected type were scrapped and replaced by . . . .

MODERN DOOR-IN-DOOR panels installed in existing "tubs". Special oversize trim was ordered to cover opening left by old panel.

GRADE SCHOOL LIBRARY had an average of 8 footcandles of totally insufficient illumination before . . . .

NEW LIGHTING INSTALLATION and double the original wattage brought intensity up to a 30-footcandle minimum.

Since the major portion of the rewiring and relighting had to be done during summer months, there could be no lag in the installation progress. From the very start, Spring Electric Company organized specialized installation crews and used this technique throughout the life of the project.

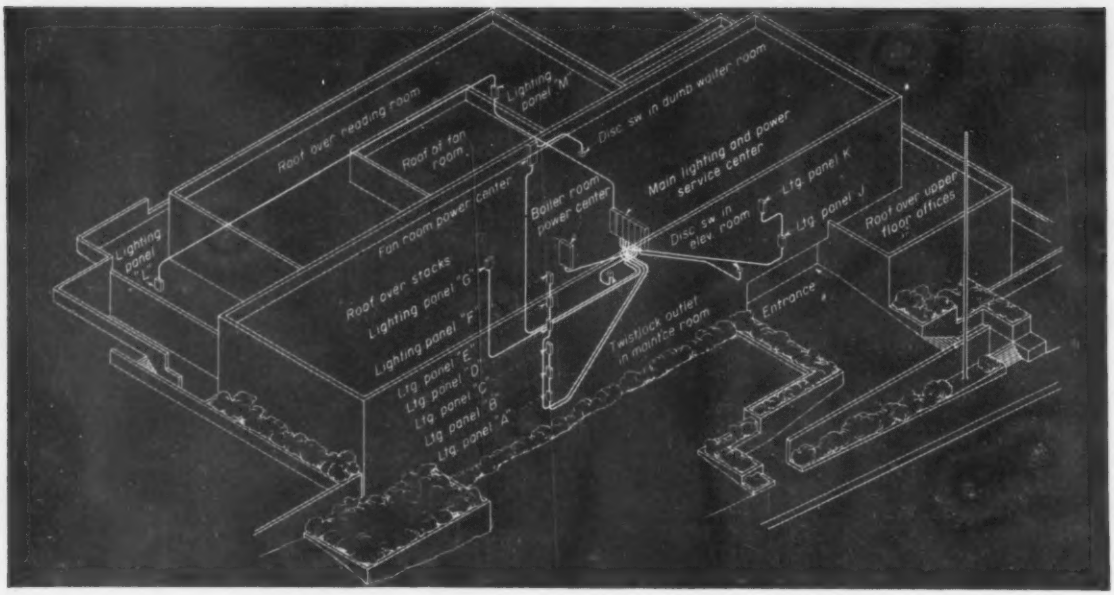
One crew did the branch circuit work—pulled out existing conductors, installed new wiring, made circuit extensions where required. An ability to quickly analyze the old wiring system and choose existing raceways for new circuits was, more or less, a prerequisite for mechanics on this assignment.

A second crew installed the new service and equipment, replaced feeders and installed the new distribution panels.

A third crew handled all fixture work—including distribution to various rooms, unpacking, assembling, installation and connection to circuits and switch control. All crews worked under the supervision of general superintendent William Spring who traveled from school to school coordinating material procurement, delivery and installation.

Power-operated equipment was used to advantage, particularly in the larger buildings like McKinley High School with more than 100 classrooms and a maze of heavy electrical feeders. Power winches were used to pull in new feeder cables. Power driven portable conveyors elevated fixtures direct from the delivery trucks to upper floor windows. Conventional hand trucks and narrow rolling scaffolds helped speed fixture distribution and installation in the numerous classrooms.

Careful planning and cooperation between contractor and school officials added considerably to the dispatch with which individual building projects were completed. On jobs where work extended into the school year, students were moved into a vacant room or auditorium—a room at a time—so branch circuit and fixture installation could continue uninterrupted.



Wiring Details of . . .

Light and Power for a Library

An on-the-job report of power and light wiring, equipment layouts, installation details —all part of electrical construction of the Los Angeles County Law Library, Los Angeles, Calif.

By C. D. Draucker, President,
C. D. Draucker, Inc., Electrical Contractors
Los Angeles, Calif.

ELECTRICAL application and installation for a modern library are well represented in the new Los Angeles County Law Library. Here, three incoming services feed distribution systems for lighting, air conditioning and other power loads throughout the building. A close look at some of the details of the overall electrical work points up equipment layout and installation on this job.

Our work began at the property line where we connected three runs of 4-inch underground conduit to the utility company's conduit. From this point these three conduit runs carry three separate services, one in each run, underground, under the floor of the building's basement, then up to a main light and power service center. One service is 3-phase, 3 wire, 240 volts for power; the other two are single-phase, 3-wire, 240-volt lighting services. Fig. 1 shows the main light and power center with three 400-amp main breakers and the various feeder breakers.

From the main distribution center, three 350 MCM conductors in 3-inch conduit feed 3-phase, 240-volt power under the floor to another power center in the boiler room nearby, Fig. 2. Pump, fan and compressor motors and electronic filters in the basement fan room are supplied from this center. Four exhaust fans on the roof are also tied into the boiler room center. A fan-room above the roof of the reading room houses another power center of breakers and motor starters, controlling supply and recirculation fans, roof ventilators, condenser pumps and filters. The overall scheme of distribution is shown in Fig. 3.

As shown in the riser diagram, Fig. 3, branch circuit lighting panels serve the two floor levels of the building and the six stack levels on which books are stored. Details of lighting installation and circuiting are given in the accompanying photos and sketches.

Architects of this modern library building were Austin, Field and Fry, Los Angeles, Calif.

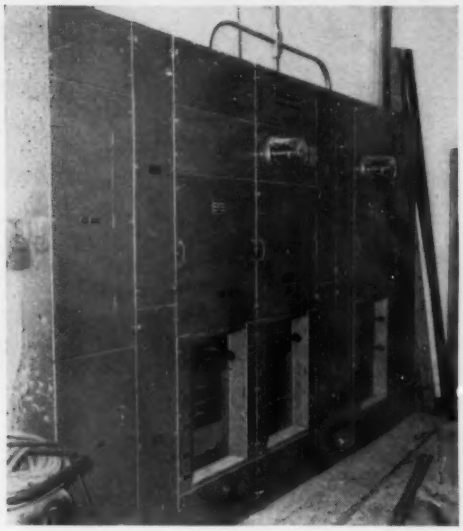

Lighting panelboard for lower floor
Lighting service meter
C.C.T. space
Power service meter
3-4 pole relays and time switch controlling outdoor lights
Circuit breakers

FIG. 1—Main light and power center, showing three 400-amp main breakers and feeder breakers.

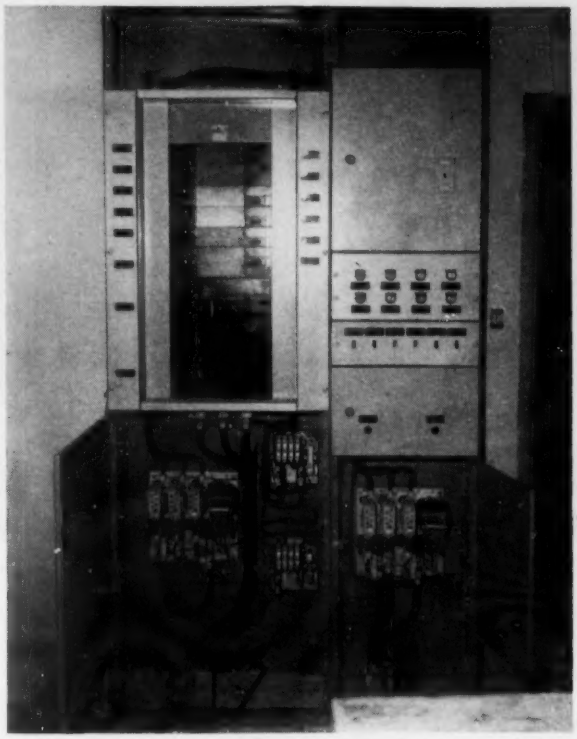


FIG. 2—Boiler room power center is fed at 240 volts, 3-phase, by three 350MCM conductors under floor (arrow) from the main light and power center. Enclosure contains four 3-phase and ten 1-phase CBs (upper left), nine motor starters (4 shown at bottom), and manual switches for air conditioning compressors, filters, pumps and fans.

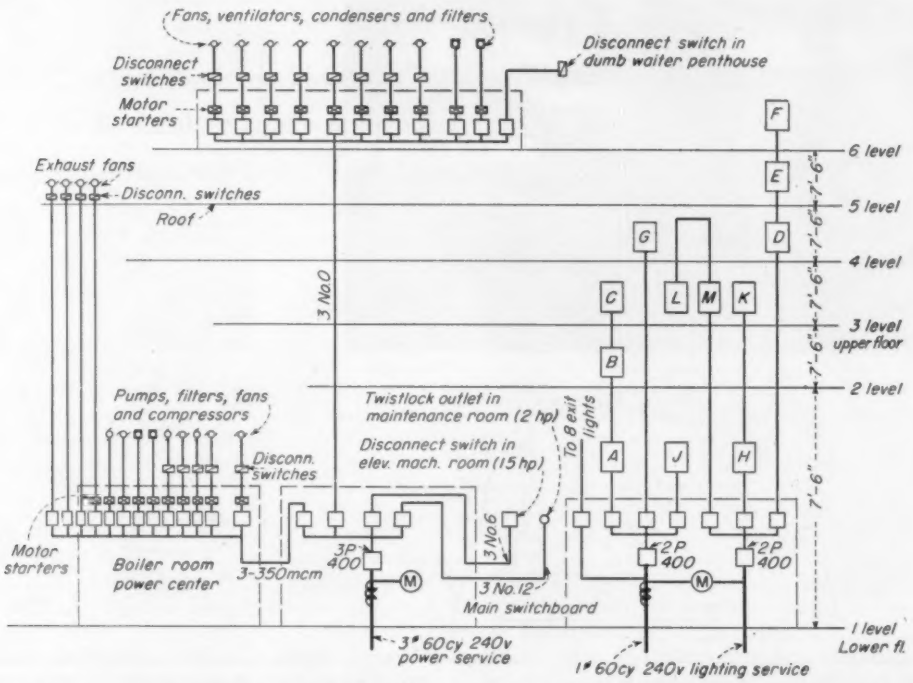
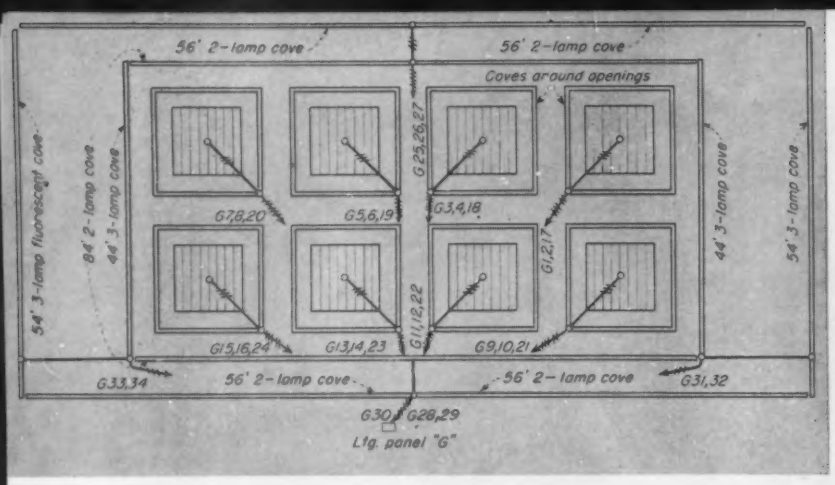
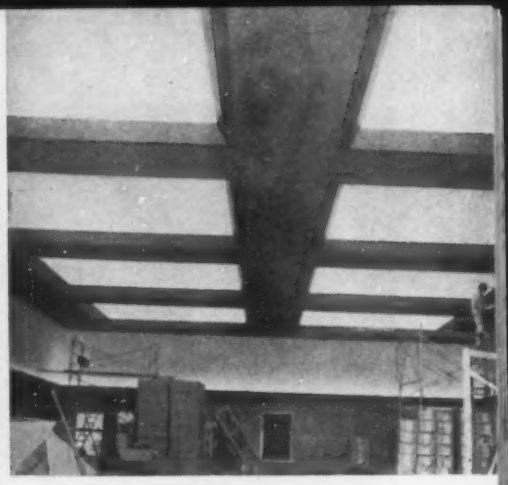
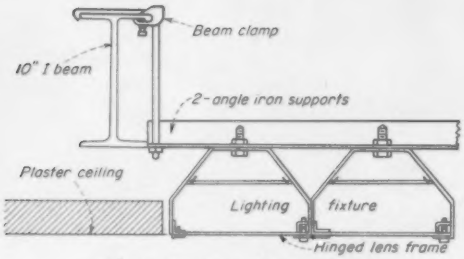


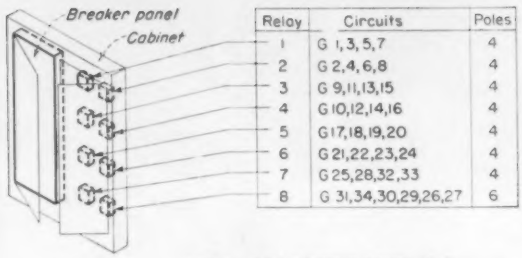
FIG. 3—Riser diagram of power and light distribution shows three services to main switchboard (right) and feeders from boiler room power center (left).







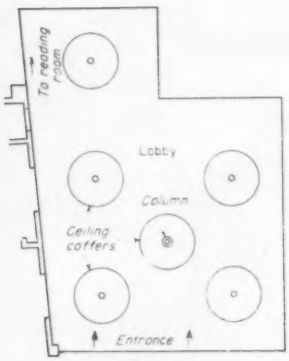
MOUNTING DETAIL OF TROFFERS

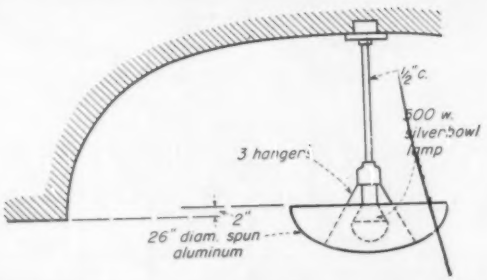


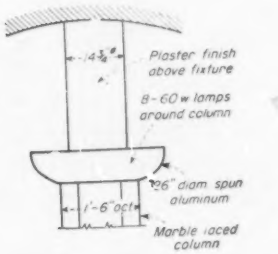
Relay	Circuits	Poles
1	G 1,3,5,7	4
2	G 2,4,6,8	4
3	G 9,11,13,15	4
4	G 10,12,14,16	4
5	G 17,18,19,20	4
6	G 21,22,23,24	4
7	G 25,28,32,33	4
8	G 31,34,30,29,26,27	6

DETAIL OF LIGHTING PANEL "G"

READING ROOM has 15-foot ceiling and is lighted by combination cove and coffer fluorescent fixtures. Around the outside perimeter of the room, a continuous cove is mounted six feet below the ceiling. Above the outside edges of the latticework canopy, reverse cove lighting is mounted. Eight 16-foot square openings in the canopy provide coffer-like recesses for panels of grouped fluorescent troffers. Above each opening, eight 3-lamp (96T-12), lens-shielded fluorescent units (4-units to a circuit) are recessed in the ceiling, side-by-side, forming a square panel of light. Mounting details of these troffers are shown above. Around the upper edge of each lattice opening, additional 2-lamp coving is installed.







MAIN LOBBY has indirectly lighted coffers in the ceiling. As shown in the diagrams, five of these coffers have suspended silverbowl lamps in aluminum reflectors. The sixth coffer has a marble-faced column between its center and the floor, with eight lamps spaced around the column within the aluminum reflector.

ST. LOUIS CONFERENCE on electric space heating kicks off campaign to develop this broad market. Contractors, wholesalers, engineers, architects, builders and bankers get the complete story.

Green Light for St. Louis Contractors on

ELECTRIC SPACE HEATING

Contractors' market for electric space heating installations in St. Louis is given new impetus by utility data on local load requirements and encouragement of electric heating.

ELECTRICAL contractors, wholesalers and electric heating equipment representatives face a door opened wide to the sale and installation of electric space heating in the St. Louis area. This encouraging fact was evident at the conclusion of a series of meetings held by the Union Electric Company of Missouri on Feb. 8, 10 and 11. Each of the three sessions was pinpointed to specific industry groups ranging from electrical contractors and builders to mortgage bankers. Each group received the complete story of electric space heating from methods and types of equipment available to advantages and operating costs. Manufacturers' representatives displayed their products and explained their application and operation to more than 400 industry representatives at the sessions.

It is apparent that the utility wants the electric heating market developed, but on a sound basis. To assure this, it distributed a fact-packed booklet as a "Guide to the Use of Electricity for Space Heating." For the first time, area contractors have available in handy reference form all the basic facts necessary to answer a customer's questions on the subject. Facts and figures were developed from a careful study of some 600 complete electric space heating installations on the utility system.

Contractors learned that adequate insulation in buildings is a must for operation of total electric heating at a minimum cost. Engineers' recommendations call for insulation providing the equivalent insulating effect of the following:

1. Four to six inches of mineral wool in ceilings.
2. Four inches of mineral wool in side walls.
3. Four inches of mineral wool in all floors above unheated basements, garages or other unheated areas.
4. Two inches of special insulation (interior perimeter seals) around edges of structure where concrete floor slab is used with no basement.
5. All windows should have double-pane glass; if single-pane, use tight-fitting storm sash and storm doors.

PRODUCT EXHIBITS ran from cable heating methods . . .

TO BASEBOARD HEATING with automatic electric panels . . .

6. All cracks should be caulked; use weather stripping on windows that open and all outside doors.

7. A vapor seal between inside wall or ceiling and insulating material should be installed to prevent condensation of moisture against outside walls.

Homes that already meet, or will meet, these requirements are good prospects for complete electric space heating—and incidentally, air conditioning. In fact, a survey of customers with electric heat revealed that 89% were satisfied where the builders followed instructions, particularly with respect to insulation.

Electric Heating Costs

There has always been a big question as to electrical capacity and operating costs of electric space heating. For the St. Louis area, this has been answered in the form of an operating cost chart covering houses ranging from 500 to 2,500 square feet of heated area. Data was compiled from actual meter-test readings in the 600 residences with complete electric heating. Energy cost is based on the 1.75 cent per kwhr residential step rate after 200 kwhrs per month have been used for other electrical loads. Capacity and cost vary from 4.1 kw and $99 for a 500-sq ft house to 20.5 kw and $484 for a 2,500-sq ft home (see chart).

Chart data on capacity, consumption and cost is based on the following factors:

1. A design condition of 0-70 degrees F (providing 70-degree indoor temperature when outdoor temperature hits zero).

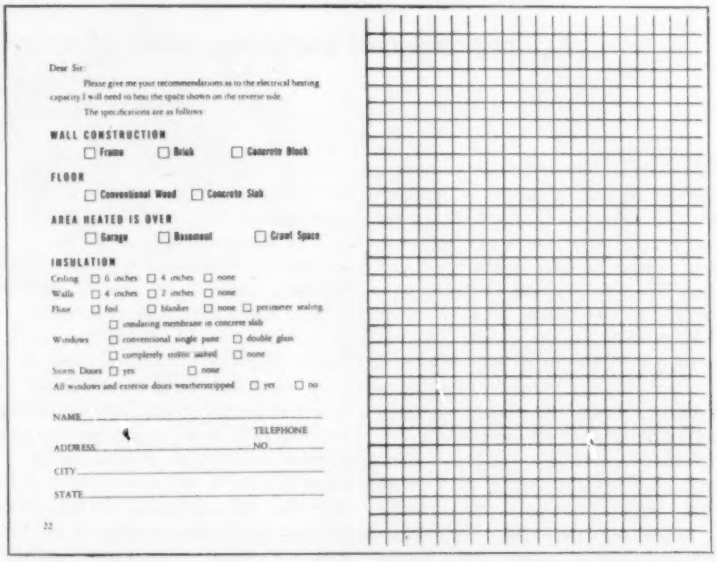
2. A normal St. Louis winter of 4,584 degree days. Distribution of heating degree days between months varies from 0.9 in September to a high of 21.8 in January, to a low of 0.2 in June.

3. A heat factor of 0.3 kilowatthour per degree day per thousand cubic feet of heated volume. This is an index of electrical consumption of a structure insulated as outlined above.

4. The present residential step-rate of 1.75 cents per kwhr after 200 kwhrs per month consumption.

Contractors were urged to use the chart figures for estimating purposes only and as a sound basis for discussing electric space heating. Calculations should be made for each individual installation since data will vary with percentage of glass area, traffic through the structure, individual temperature preferences and similar items.

Admittedly, operating costs for elec-


Dear Sir:

Please give me your recommendations as to the electrical heating capacity I will need to heat the space shown on the reverse side.

The specifications are as follows:

WALL CONSTRUCTION

☐ Frame ☐ Brick ☐ Concrete Block

FLOOR

☐ Conventional Wood ☐ Concrete Slab

AREA HEATED IS OVER

☐ Garage ☐ Basement ☐ Crawl Space

INSULATION

Ceiling ☐ 6 inches ☐ 4 inches ☐ none

Walls ☐ 4 inches ☐ 2 inches ☐ none

Floor ☐ foil ☐ blanket ☐ none ☐ perimeter sealing ☐ insulating membrane in concrete slab

Windows ☐ conventional single pane ☐ double glass ☐ completely storm sashed ☐ none

Storm Doors ☐ yes ☐ none

All windows and exterior doors weatherstripped ☐ yes ☐ no

NAME _____

ADDRESS _____ TELEPHONE NO. _____

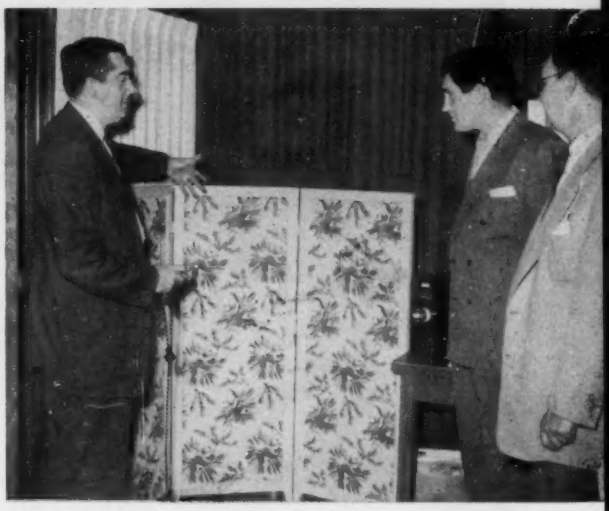
CITY _____

STATE _____

22

SIMPLE FORM in facts-booklet makes it easy for prospective customer to secure complete information of electric space heating.

AND SPACE HEATERS for various applications . . .



TO ELECTRICALLY HEATED decorative screens.

tric space heating are higher than for heating with any of the combustible fuels, but this is only part of the total "cost" story, the facts-booklet points out. True comparison should be based on "owning cost". This includes initial investment in the heating system; fixed charges in interest and depreciation; repairs and upkeep; cost of energy for motors, fans, blowers, etc., needed on many heating systems; and the operating cost of fuel. When all these are considered, the "owning cost" of electric space heating may be competitive with "old fashioned heating methods."

The conference—and the booklet—explored the market and costs of auxiliary and supplementary electric space heating. And to top it off, the booklet contains a tear-out page on which a customer can give essential data about his home and send it to a contractor, or the utility, to secure detailed electric heating information. One side has an easy check list on construction, area, insulation, etc. The back is cross-section ruled for easy sketching of the area to be heated.

St. Louis has started the ball rolling with one of the first electrical industry promotions of electric space heating. The basic experience facts and figures on which to launch an aggressive sales program are at hand. Contractors, suppliers, home owners and the utility stand to benefit from the campaign. Other cities and areas have the same opportunity to get on the band wagon—when local conditions permit such action, with the groundwork done in St. Louis and the resulting experience available as valuable reference.

ESTIMATED ANNUAL COST OF RESIDENTIAL SPACE HEATING
for a Completely Insulated House in the St. Louis area

Total Floor Area of Heated Space (Sq. Ft.)	500	750	1,000	1,250	1,500	2,000	2,500
Total Volume of Heated Space in Cubic Feet (8 Ft. Ceiling)	4,000	6,000	8,000	10,000	12,000	16,000	20,000
Minimum Heat Loss *(3.5 Btu/hr./cu. ft.)	14,000	21,000	28,000	35,000	42,000	56,000	70,000
Minimum Capacity of Heating System	4.1 kw	6.2 kw	8.2 kw	10.3 kw	12.3 kw	16.4 kw	20.5 kw
Kilowatt-hours Required for Heating	5,500	8,250	11,000	13,750	16,500	22,000	27,500
Heating Cost	$99	$147	$195	$243	$291	$388	$484

* Btu—British Thermal Unit—The quantity of heat required to raise the temperature of one pound of water 1 degree F. at or near its point of maximum density.

Note: (1) Each one-foot increase in ceiling height over 8 feet will increase heat loss, installed capacity, kilowatt-hour consumption and operating cost approximately 8 to 10%.

Note: (2) Each increase of one degree above 70°F. at which house temperature is maintained will increase operating cost by approximately 4½%.

Note: (3) Lowest step residential rate of 1.75 cents per kwhr.
From Union Electric Company's Facts-Booklet.

OPEN PATIO at Hotel Statler is spectacularly lighted, provides artistic view from Terrace Room (left), two-level lobby, and room suites above. Both white and color lights are used. Perimeter lights on walls each contain 2 150-watt PAR 38 lamps. Reflector lamps with color lenses light trees and foliage. Watertight units in pool make it center of interest.

Light's Role in Los Angeles

Light decorates city's Boulevards at night, dramatizes displays, speeds commercial and industrial work by day.

WILSHIRE Boulevard's "Miracle Mile" in Los Angeles, and Hollywood's world-famous Hollywood and Vine, are veritable displays of spectacular and dramatic lighting by night. They provide appealing and attraction-getting fixed and mobile decorative lighting effects, set a high standard for other Los Angeles community centers to follow. Of comparable merit, but less dramatic perhaps, are hundreds of commercial and industrial lighting jobs throughout the city, providing eye-comfort lighting for selling, work, study, and recreation. Some typical examples are shown on these two pages, for which photos were supplied by Roy Kreyser, illuminating engineer for the Department of Water & Power of the City of Los Angeles.

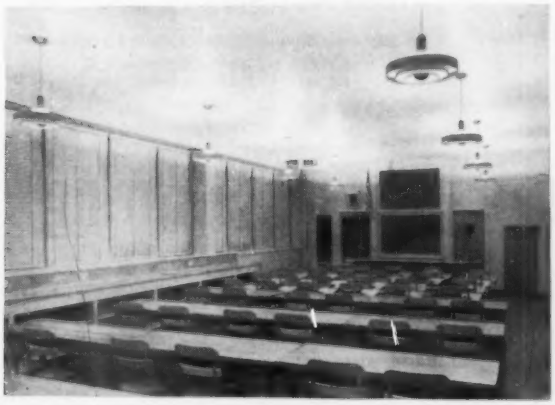
SHOWROOM of Bruck's Oldsmobile displays new autos under wall-to-wall luminous ceiling illumination. Area is 30 ft by 70 ft, and ceiling contains 525 pressed vinyl plastic 2-ft square panels, supported on metal grid. Single lamps on 24-in centers provide 80-85 footcandles.

SHOP of Spratt Optical Co. is lighted by combination of direct and indirect lighting. Cone units with reflector spot lamps light displays. Concentric ring coffers, with silverbowl lamps, light customer booths. Reception area is lighted by reflected light from ceiling over beams.

BARBER SHOP in Beverly-Wilshire Hotel has 120 footcandles of shadowless lighting at point of work, which customers and barbers both agree is highly satisfactory. Over each barber chair is a recessed 4-ft. square Ruby louvered unit, each containing six 40-watt standard fluorescent lamps.

ENGINEERING office and drafting room of AiResearch, Inc. is provided with average intensity of 100 footcandles by 6.2 watts per sq ft from louvered slimline 4-lamp luminaires installed in continuous rows. Total of 426 Smoot-Holman luminaires lights the 27,500-sq ft area.

PRODUCTION area at Louart Clothing Corp. is lighted to an intensity of 50 footcandles by 2-lamp slimline louver-shielded fluorescent units installed in continuous rows on 9-ft centers, and suspended 24 in. from the 11-ft ceiling. Units are Sunbeam L1282-96SL-430, with 34% upward component.



SCIENCE ROOM in San Fernando High School has average intensity of 34-36 footcandles, provided by ten 500-watt bowl silvered lamps in concentric ring suspended luminaires. Room is approximately 23 ft by 50 ft, and is one of 20 such rooms in this school. Light finishes improve visual comfort.

OFFICE of Northwestern Mutual Fire Insurance Co. is attractively lighted by variety of lighting methods. Over center area of 2,080 sq ft is a CEPCO louver ceiling. Around perimeter are luminous dome units with silverbowl lamps and recessed flush lens units. Average intensity is 55 footcandles.

DOPE SHEET FOR OUR WIRING
• TO LIGHT FRONT PORCH LAMP TURN ON CELLAR LIGHT SWITCH.
• DON'T USE TOASTER IF REFRIGERATOR IS RUNNING
• BE SURE BREAKFAST ROOM SWITCH IS "ON" BEFORE TURNING ON "TV" IN LIVING ROOM.
• IF KITCHEN LIGHTS "BLOW" REPLACE FUSE IN BOX, MARKED "BACK BATHROOM".
• IF ELECTRIC CLOCK STOPS, "JIGGLE" TAPS IN WALL OUTLET.
• FIRE DEPT. PHONE NUTHILL-1045.
"SCREWTNY DID SOME OF THAT "DO IT YOURSELF" REWIRING BUT I FINALLY FIGURED IT OUT!"

SHE SHOULD RESTRICT HIM TO JUNIORS ERECTO-SET—
... AND CALL A LICENSED ELECTRICAL CONTRACTOR

MANY "DO IT YOURSELF" HOME REPAIRS ARE SAFE AND PROFITABLE HOBBIES"
—BUT **NOT** ELECTRICAL WIRING! *CALL A LICENSED ELECTRICAL CONTRACTOR.*

ELECTRICAL WIRING IS ONE THING THAT SHOULD NOT BE A
"DO-IT-YOURSELF" PROJECT. *CALL A LICENSED ELECTRICAL CONTRACTOR.*

ELECTRICAL WIRING SHOULD ALWAYS BE DONE
BY A LICENSED ELECTRICAL CONTRACTOR

Cartoons Ridicule "Do-it-yourself" Wiring

Sharply barbed shafts of skillful cartooning have been brought to bear on the home electrician. Dudley Rice of National Electric Products Corporation, Pittsburgh, prepared these cartoons for the use of electrical contractors to help combat the growing danger of amateur modifications to home wiring systems.

Because of the importance of the subject and because the cartoons lend support to our own views (see "'Do-it-yourself' Crisis", page 61, April *Electrical Construction and Maintenance*), we obtained his permission to present them to our readers.

Survey of Industry's Plans for . . .

New Plants and Equipment

1 Manufacturing industry plans to spend as much for new plants and equipment in 1954 as it did in 1953.

2 Industry as a whole plans capital expenditures this year about 4% lower than in 1953.

3 Industry's plans are geared to rising sales over the long term.

EDITOR'S NOTE: What business spends for new plant expansion and for modernization of existing facilities is reflected in the market for services of the electrical construction and maintenance industries. Modernization generally accounts for an even greater share of the construction dollar for electrical work than does new plant construction. Thus business' plans for continuation of capital expenditures for added capacity at a high rate for the next four years, with an increasing percentage in modernization, as revealed by McGraw-Hill's seventh annual survey in this field as reported here, is an important guidepost to markets ahead for electrical construction work.

MANUFACTURING industries expect to spend $12.3 billion for new plants and equipment in 1954, which is about the same amount as in 1953. Petroleum, food, machinery, electrical machinery and automobile companies plan to spend more than in 1953. Auto makers plan the largest increase—29%. The chemical, steel, textile and transportation equipment industries plan to spend less for new plants and equipment than they did last year, as do the majority of other manufacturing industries.

The high level of capital expenditures now planned by manufacturers represents a shift in plans since last fall. At that time, manufacturers who cooperated in a preliminary McGraw-Hill survey of investment plans reported that their expenditures would decline by 8% in 1954. Since that time, almost every major manufacturing industry has increased its plans. This shift is most striking in the case of the machinery, automobile and petroleum companies. Replies to the survey also show that it is in general the large companies that are planning to spend more for plants and equipment this year. Smaller companies, by and large, plan to cut their expenditures.

Preliminary Plans for the Future

Over the longer run, 1955-1957, industry already has preliminary plans to spend an average of $17.5 billion a year for new plants and equipment. Actual expenditures may be substantially higher than the current estimates for these years, if plans are revised as they have been in the past. Experience indicates that businessmen usually underestimate their capital expenditures for periods longer than one year.

While investment plans for future years may be altered, they are nevertheless a significant guide to industry's intentions. Two manufacturing industries—chemicals and textiles—already have plans to spend more for new plants and equipment in 1957 than they expect to spend this year. Railroads and petroleum refiners also plan capital spending in 1957 at levels that are relatively close to those expected in 1954.

Manufacturing industry plans to increase its productive capacity by 4% in 1954, and another 9% by the end of 1957. This rate of expansion is considerably below that recorded in recent years. Manufacturing capacity increased by 7% in 1953, and 9% in 1952 (Table 1).

Chemical and electrical machinery companies plan the largest increases in capacity in 1954-1957. Transportation equipment companies, including aircraft, expect to expand substantially in 1954, but at a slower rate in 1955-1957. Only three major industries—steel, petroleum refining and transportation equipment—now plan to expand capacity during 1954-1957 at a rate markedly slower than the average for all manufacturing.

Companies that are expanding capacity rapidly are mostly those with new products for consumers—like electric appliances—or new types of machinery for civilian industry. Chemicals are expected to continue their long-term growth.

Why is business still expanding

TABLE 1. HOW MANUFACTURING INDUSTRY IS EXPANDING CAPACITY

Index of Industrial Capacity (1939 = 100)

	Actual Capacity Expansion						Planned for		Capacity — Per Cent Increase		
	Jan. 1946*	1948	1950	1951	1952	1953	1954	1957	1952-53	1953-54	1954-57
Steel	112	115	126	130	140	147	150	153	5	2	2
Machinery	154	200	236	271	304	325	338	368	7	4	9
Electrical Machinery	175	280	325	354	400	452	493	562	13	9	14
Automobiles	104	130	153	170	196	202	210	221	3	4	5
Transport Equipment (including aircraft)	243	250	288	328	423	495	530	546	17	7	3
Food	117	135	143	152	157	162	172	184	3	6	7
Chemicals	172	250	293	322	357	393	421	514	10	7	22
Petroleum Refining	123	160	178	185	194	208	216	225	7	4	4
Other Manufacturing	109	120	133	141	148	157	162	178	6	3	10
ALL MANUFACTURING	131	156	175	187	204	218	227	247	7	4	9

*All other data as of end of year

rapidly and spending heavily for new plants and equipment in the face of declining sales? In the past, large cuts in capital expenditures have usually followed sales declines.

One reason for industry's continued plans for heavy investment in new plants and equipment seems to be that businessmen are looking beyond the current letdown in sales to new growth in the future. Manufacturers, as a group, report that they expect sales to decline by about 2% in 1954. But they expect sales to pick up in later years. By 1957, the average manufacturing company anticipates that its sales will be up by 12% over the 1953 sales level.

Perhaps even more important in plans for expanding capacity is the aim of individual companies to increase their share of the market. In industry after industry, companies report that their sales will expand much faster between 1953 and 1957 than will the sales of their competitors. Manufacturers, as a group, think that industry sales will increase by 4% between 1953 and 1957. But they expect sales of their own firms to grow fully three times as fast, on the average.

This prospect of sharper competition shows most clearly in the plans of non-electrical machinery makers. Individual machinery companies think that their own sales will increase five times as much, on the average, as the sales of their industry. Textile companies think that they can push their sales up three times as fast as the textile industry as a whole. Except for the steel industry, companies in every major field of manufacturing think that they will get ahead of their competition in the next four years. Even in the transportation equipment industry, where sales are expected to decline, individual firms report that their own sales will fall considerably less than sales of the industry.

Comparison of these expectations with the results of last year's McGraw-Hill survey shows that individual firms plan to meet their sales goals by competing harder, despite less optimism about industry prospects. Last year, businessmen reported that they expected total sales by manufacturing industry to grow by 10% between 1952 and 1956. They expected their own company sales to grow by 13%—about one-third faster. But now they plan to beat their industries' sales growth by three to one.

Modernization to Increase

That more intense competition is in the offing is also indicated by the division of capital spending plans between expansion and replacement and modernization. While substantial additions to capacity are still being planned for 1954-1957, business is putting greater emphasis than in recent years on modernizing or replacing older plants. Replacement and modernization means cost cutting, an essential for many companies that want to prosper in the competitive period they see ahead.

Last year, manufacturing companies used 48% of their capital expenditures for expansion, 52% for replacement and modernization. This year, they expect the share for modernization to rise to 57%. Under present plans, this share is expected to reach 61% of capital expenditures in the 1955-1957 period. (Table 2)

Cutting costs—the object of most expenditures for replacement and modernization—frequently means cutting labor costs. Companies were asked to estimate how much their employment would change between 1953 and the end of 1957. Many of them were unable to answer this question. But, of those that did, a number clearly expect substantial savings in labor costs over the next four years. Companies in the chemical industry, for instance, expect to increase sales by 30%, while adding only 16% to their labor force. Cement manufacturers expect a 9% growth in sales, but only a 1% increase in work force. Paper and electrical machinery manufacturers also expect substantial increases in output per worker.

Manufacturing companies report that they have considerable leeway —both up or down—for adjusting capital spending plans if business conditions change.

Companies were asked what was the *minimum* amount they would spend for new plants and equipment in the years 1954-1957, even if their sales declined substantially. They were also asked what was the *maximum* amount they

TABLE 2. WHAT INDUSTRIES PLAN TO SPEND FOR
(Expansion vs Modernization)

	1953		1954		1955-57	
	Expansion	Modernization	Expansion	Modernization	Expansion	Modernization
	%	%	%	%	%	%
Steel	48	52	16	84	14	86
Machinery	55	45	53	47	45	55
Electrical Machinery	60	40	61	39	38	62
Automobiles	35	65	36	64	21	79
Transport Equipment (including aircraft)	57	43	24	76	8	92
Food	41	59	37	63	30	70
Chemicals	70	30	66	34	67	33
Petroleum	46	54	47	53	36	64
Textiles	10	90	10	90	7	93
Other Manufacturing	45	55	42	58	47	53
ALL MANUFACTURING	48	52	43	57	39	61

could invest if they were able to take advantage of all the technological developments in their industries.

Manufacturing industry, as a whole, reports that its 1954 investment program is about 15% below the maximum that could be spent under ideal conditions—and nearly double the minimum it would spend if sales dropped badly. Thus, there is a lot more leeway for spending to go down than up from the 1954 level. But that's not true for 1955-1957. The average amount of capital spending now planned for 1955-1957 is just about half way between industry's maximum and minimum estimates, with a little more room for increases than for decreases.

Steel, textile and food companies report the greatest leeway for increasing capital expenditures from the 1954 level to take advantage of technological developments. The transportation equipment, electrical machinery and steel industries have the greatest leeway to reduce capital spending if sales decline.

For the longer period, 1955-1957, transportation equipment, as well as steel, food and textile companies, show the greatest room for expanding their investment programs. Aircraft companies could spend three times what they now plan to spend for new plants and equipment in 1955-1957, if they could take advantage of all technological opportunities. Steel, machinery and chemical companies would cut capital spending most if sales fell badly. Even these industries, however, say they would not cut capital spending by more than 50% below the level they have already planned for 1955-1957.

Planning Ahead

A great majority of companies can now give at least preliminary estimates of capital expenditures for the future. This year, more than nine out of ten companies participating in the survey were able to estimate their capital spending for the next four years, compared to 81% in 1953 and 65% in 1952.

But fewer companies than in the past now plan their capital expenditures in detail for two years or more in advance. In 1952, 93% of manufacturing companies reported that they planned their capital spending at least two years ahead. Last year, the percentage fell to 63%, and now it's 56%. The decline in detailed advance planning probably reflects the completion or near completion of the big, long-range expansion programs that were started after the attack on South Korea in June, 1950. The same trend appears in reports from railroads and airlines.

However, companies that do make detailed advance capital spending plans now frequently plan farther into the future than they did in 1952 and 1953. This year, 17% of the companies reported that they plan capital expenditures for five or more years into the future, compared to 2% in 1952 and 1953. Among manufacturing companies, five-year planning is most common in steel, electrical machinery and petroleum.

Depreciation Policy

By an overwhelming margin, manufacturing companies report that they usually reinvest all of their depreciation allowances in new plants and equipment. This practice is reported by 90% of all manufacturing companies that participated in the McGraw-Hill survey. Food and petroleum companies are reinvesting all of their depreciation charges. Only in the transportation equipment and steel industries do fewer than 80% of companies reinvest all depreciation funds.

Many companies would use added depreciation funds in more than one way—for instance, 55% would spend more for new plants and equipment, 31% would rely less on outside funds, and others would reduce debt and increase capital expenditures. Others say that they would reduce debt now, increase capital spending later on. A number report that their policy would depend on economic conditions and the degree of competitive pressure in their industry.

Research, Capital Spending and Sales

Research developments—new products, new processes, new machines—will be important factors in a competitive period like the one businessmen see ahead. Electrical machinery companies expect to spend nearly three-quarters as much for research as for new plants and equipment in 1954. Chemical, other machinery and transportation equipment companies also plan to spend at least one-third as much for research as for plants and equipment. At the other end of the scale, research spending planned by the steel industry is very small—4% in 1954—compared to its capital expenditures.

Chemical and electrical machinery companies also expect to spend the most for research in relation to sales —3%. Machinery manufacturers report that they expect their research expenditures to reach 2% of sales in 1954. Meat packers and steel manufacturers plan the smallest research spending in relation to sales.

It may be significant that two of the industries that spend the most for research in relation to capital expenditures and sales—chemicals and electrical machinery—are the two that expect the greatest sales growth between 1953 and 1957. And companies in the other two industries that spend heavily for research as compared with capital expenditures expect to improve their competitive positions greatly by the end of 1957.

L-V Switching Solves Control Problem

in new 8-story building

Low voltage remote control switching system provides master control from basement for individual air conditioning units in new medical building in New Orleans, La.

By Mario G. Zervigon

Louis N. Goodman and Associates, Consulting Electrical Engineers, New Orleans, La.

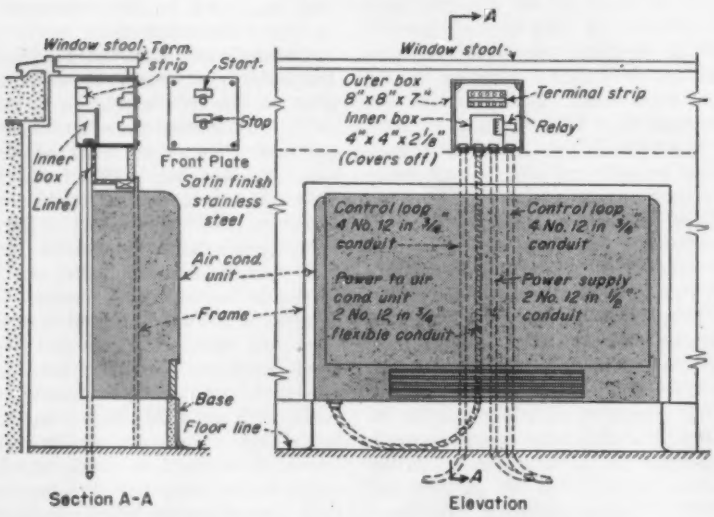


FIG. 1—LOCAL CONTROL STATION at a typical air-conditioning unit.

AN UNUSUAL application of low voltage remote control relays has been used to solve a difficult switch control problem in the new eight-story addition to the Louisiana State University Medical Building, New Orleans, La. These relays, which have become increasingly popular for control problems in residential and farm wiring, have been used to give individual and master control of individual air conditioning units throughout the building. Essential on-off control of the individual units at each office has been retained, and duplicate control from a basement equipment room has been provided. The building engineer may therefore turn off all units at night, and on again in the morning before the office occupants arrive, from a remote central point in the basement.

The heart of this switch control system is the compact outlet-box mounted relay, which operates as an electrically operated, mechanically held contactor with one 24-volt winding for closing and one for opening the main contacts. These contacts are usually rated 15 amperes, or ½-hp at 125 volts. The arrangement permits multiple switching of an outlet by means of any number of momentary contact, single pole, double throw, low voltage pushbuttons connected in parallel. The low voltage

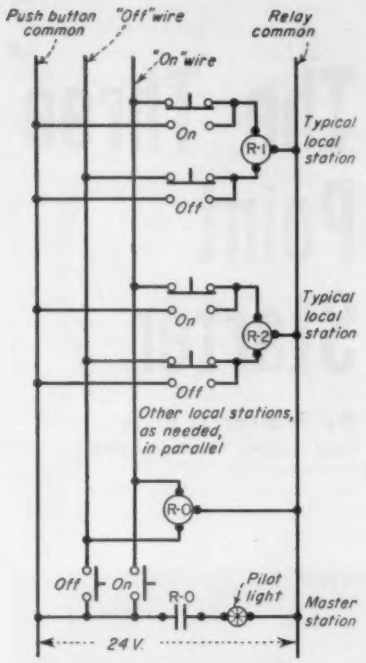


FIG. 2—SCHEMATIC CONTROL WIRING DIAGRAM shows master control station with pilot light.

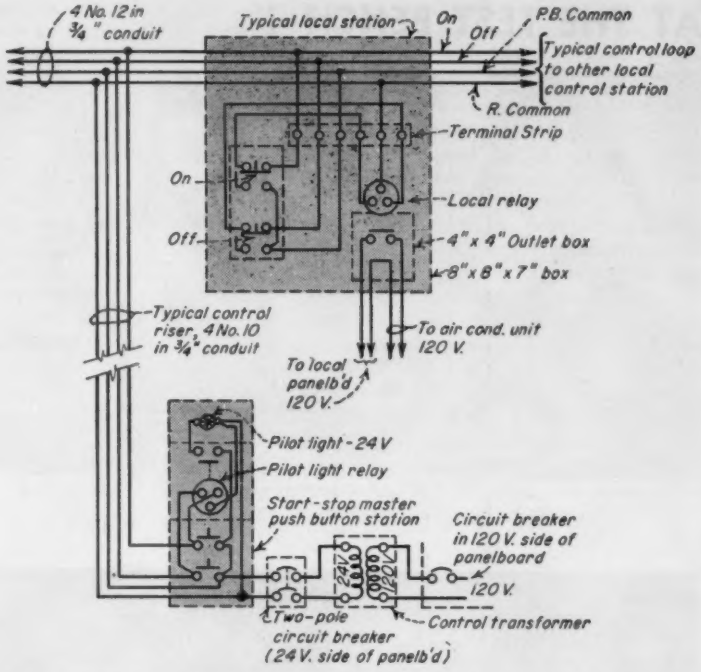

4 No. 12 in ¾" conduit
Typical local station
On
Off
P.B. Common
Typical control loop to other local control station
R. Common
Terminal Strip
On
Off
Local relay
4" x 4" Outlet box
8" x 8" x 7" box
Typical control riser, 4 No. 10 in ¾" conduit
To air cond. unit 120 V.
To local panelb'd 120 V.
Pilot light - 24 V
Pilot light relay
Start-stop master push button station
Circuit breaker in 120 V. side of panelboard
120 V.
Two-pole circuit breaker (24 V. side of panelb'd)
Control transformer

FIG. 3—TYPICAL WIRING DIAGRAM showing circuit hookup for push button switches and relays. Master push button stations and control transformers are in basement, local stations on floors above.

wiring is usually Class 2, self-energy limiting.

In the new LSU Medical Building addition a large part of the building is given over to small offices and laboratories, each with an individual air conditioning unit using chilled water as the cooling medium and a ½-hp multispeed fan as a means of adjustment. This arrangement is very desirable for these offices and laboratories where professors and graduate students do work of varied nature and may keep irregular hours. Individual control of these air conditioning units is almost essential, and duplicate master control from a central location is also very desirable.

Three-way switching in this case is impractical because of the complexity of the wiring and the voltage drop resulting from the long distances involved. The low voltage relays were an obvious solution for the voltage drop problem, but the wiring complexity remains except that it is now transferred to the low voltage side. Each relay coil requires three individual low-voltage wires, which means 411 wires all converging on the control point in the basement from the 137 units throughout the building. The controls might be somewhat simplified by the use of standard master units

(Continued on page 132)

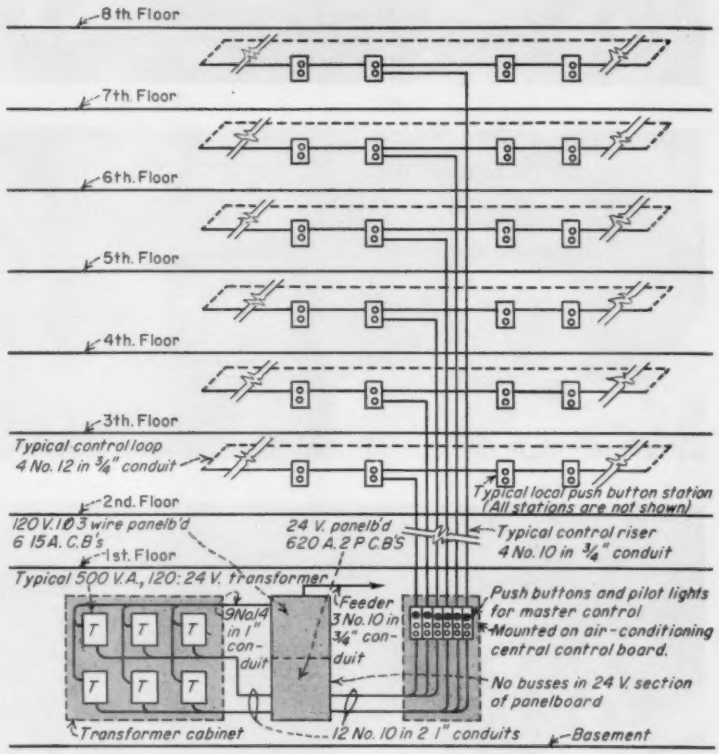
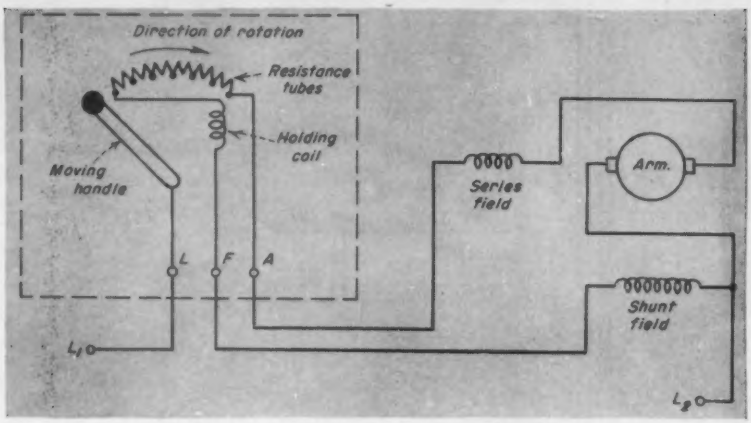
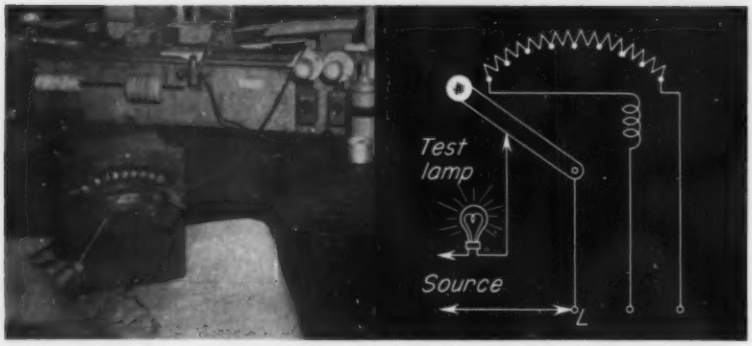

8th. Floor
7th. Floor
6th. Floor
5th. Floor
4th. Floor
3th. Floor
Typical control loop 4 No. 12 in ¾" conduit
2nd. Floor
120 V. 1Ø 3 wire panelb'd 6 15 A. C.B's
1st. Floor
Typical 500 V.A., 120: 24 V. transformer
9 No. 14 in 1" conduit
Feeder 3 No. 10 in ¾" conduit
24 V. panelb'd 620 A. 2 P C.B's
Typical local push button station (All stations are not shown)
Typical control riser 4 No. 10 in ¾" conduit
Push buttons and pilot lights for master control Mounted on air-conditioning central control board.
No busses in 24 V. section of panelboard
Transformer cabinet
12 No. 10 in 2 1" conduits
Basement

FIG. 4—ONE-LINE CONTROL RISER DIAGRAM showing master control station in basement and control loops for the various floors above.



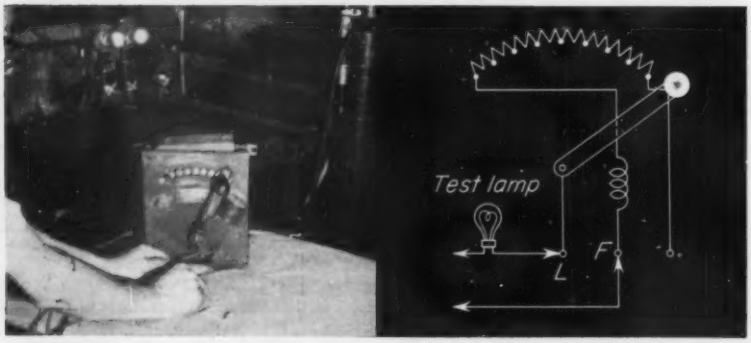
The Three Point Starter

By Walter J. Prise
Chief Engineer, The Maintenance Co., Inc.
New York, N. Y.



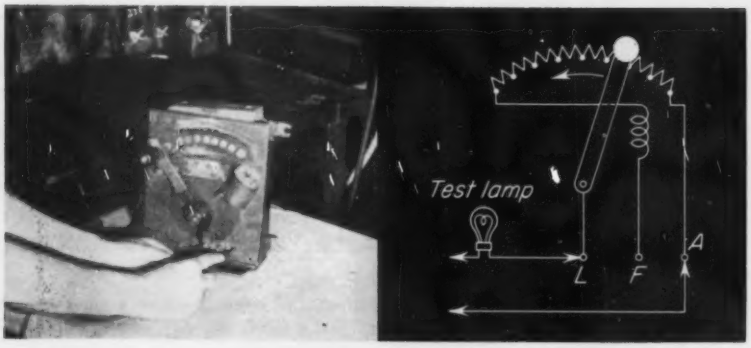
STEP 1.

Locating the line terminal on the starter with a test lamp. Put one test probe on an uninsulated part of the handle; move the other probe from button to button until lamp lights. Mark this terminal "L".



STEP 2.

Locating the field terminal. Put one test probe on the line post "L"; move handle to final position; then touch other probe to the other two posts to find the one which completes the holding coil circuit and holds the handle firmly in the final position. This post is the field terminal. Mark it "F".



STEP 3.

Locating the armature terminal. If the two previous steps were taken, the remaining post is the armature terminal. Mark it "A". To make sure of this, put one test probe on the line post "L"; touch the other probe to the "A" post. If the handle is then moved to the final position, it will fly back to its original position because the holding coil is not energized.

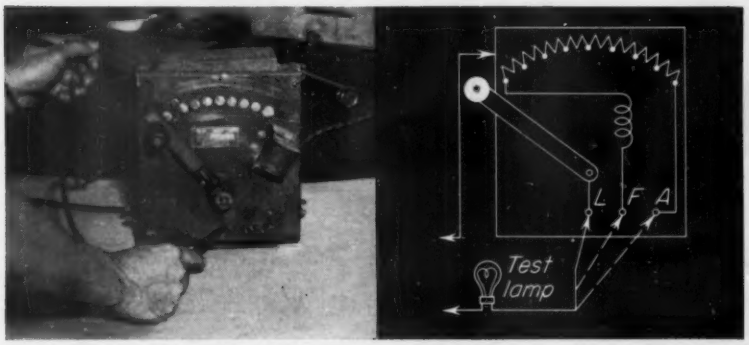
SIMPLE faceplate starters used with shunt and compound wound dc motors are better known as "three point starters"—from the three terminal binding posts on the face of the unit. These terminals are usually identified by letters: "L" for line, "F" for field and "A" for armature. Clear and correct identification of these posts is necessary for proper motor hookup.

The first diagram shows how the terminals are connected—"L" to the incoming power line, "F" to the shunt field of the motor and "A" to the armature (in this case, through the series field of the compound wound motor). The manually operated moving handle regulates the amount of resistance in the armature circuit. The holding coil, which is in the shunt field circuit, magnetically holds the handle in its final position with all of the resistance out of the armature circuit.

This starter is commonly used with dc motors of 1- or 1½-hp capacity. For motors of lower horsepower rating, across-the-line starting is usually used.

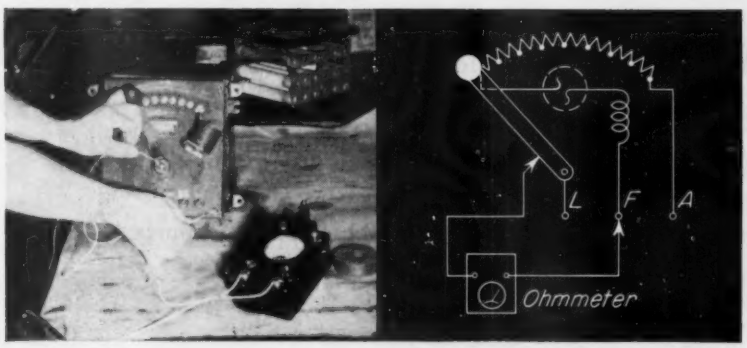
A three-point starter is operated by gradual movement of the handle from left to right. As the contact on the handle passes each face contact, it reduces the resistance of the armature circuit. Current flows from the line wire to the handle, through the starting resistance and armature circuit and back to the other side of the line. As soon as the handle comes up to the first contact, the field and holding coil are energized. Movement of the handle to the right must be made slow enough to permit the motor gradually to pick up speed and develop counter voltage. At the last contact on the face plate, all resistance is out of the armature circuit and the holding coil will hold the handle in the final position until the field circuit is interrupted. The coil will then be de-energized and the handle will fly back to its original position. This effect is called "no field" protection; the motor would reach destructive speeds if allowed to operate without a field.

The accompanying series of tests is made on a typical three-point starter. Only a test lamp and ohmmeter are used. These simple tests check the condition of the starter and will readily reveal any defects in the unit. The first three steps cover the problem of identifying the three terminal posts when no lettering or other marking on the face plate indicates the "L", "F" and "A" posts. Steps 4, 5, and 6 check the circuitry of the starter.



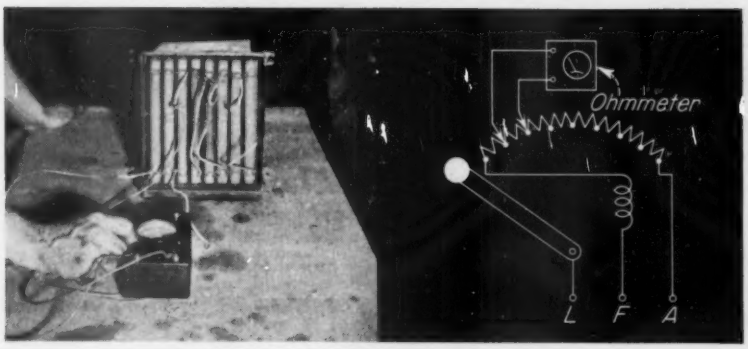
STEP 4.

Checking for ground. Holding one probe of the test lamp on the starter's case, move the other probe from terminal to terminal ("L", "F" and "A"). If the lamp *does not light* there is *no ground.*



STEP 5.

Using an ohmmeter. An ohmmeter instead of a test lamp could have been used for Step 1. The reading would have been zero ohms, indicating that the line and handle are connected together. The ohmmeter is used in this step, showing how an open in the holding coil circuit can be quickly located. Probes are touched to the handle and the field terminal. A reading of infinite resistance indicates the open.



STEP 6.

Testing resistance tubes. An ohmmeter is used to check the condition of resistance tubes. Ohmmeter is shown connected to resistor leads which were disconnected from the back of the contacts in the face plate. Individual resistors can be checked for shorts and opens.

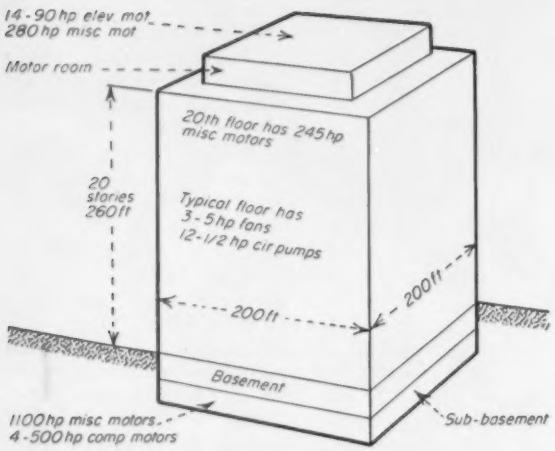


FIG. 1—MODERN BRICK OFFICE BUILDING, fully air conditioned and equipped with fluorescent lighting in all general areas, serves as an example for economic comparison between 480Y/277-volt and 208Y/120-volt primary distribution.

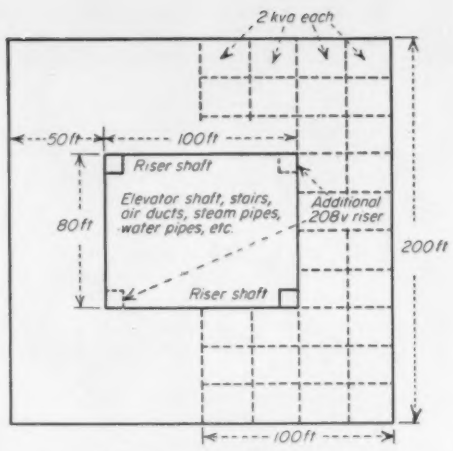


FIG. 2—TYPICAL FLOOR PLAN has 32,000 sq. ft. of rentable area, wired for 4 w/sq ft of lighting and 1½ w/sq ft of miscellaneous electrical load. Center of building contains risers, elevator and service shafts, stairs and other non-rentable space.

Commercial High-Voltage Installations—Part II

Large office buildings having major motor loads and general area fluorescent lighting can realize savings in excess of $25 per kva of demand (and over 20 cents per square foot of rentable floor space) by installing primary 480Y/277-volt systems. Here are convincing arguments for high-voltage distribution in commercial structures, and some economic comparisons.

By D. L. Beeman and H. D. Kurt
General Electric Company
Schenectady, N. Y.

AS THEORETICALLY indicated in Part I of this article, there are definite economic advantages to be obtained in large commercial office buildings by using basic 480Y/277-volt distribution systems (with small dry-type stepdown transformers for local low-voltage applications), rather than serving the structures entirely by 208Y/120-volt installations. In this second and concluding discussion, the foregoing theoretical points will be proved by considering specific installations, the first of which will be a modern 20-story office building, fully air-conditioned and located conveniently for both 208Y/120-volt and 480Y/277 (or 460Y/265-volt) utility network service. For this study it is assumed that power used by individual tenants is metered (rather than being supplied by the owner and included with the rentals) and fluorescent lighting fixtures for general area lighting are furnished by the building owner.

As indicated in Fig. 1, the structure used for illustrative purposes is a simple block building containing a basement (where entrance switchgear is located), a sub-basement (in which air-conditioning motors are located), and a penthouse motor room for elevator and miscellaneous power drives.

Electrical equipment in the sub-basement includes four 500-hp compressors (induction motors with wound rotors, secondary resistance starters), four 75-hp compressor water pump induction motors, four 60-hp chilled water pump induction motors, one 60-hp water pump, two 60-hp fire pumps and two 50-hp house pumps. There are also

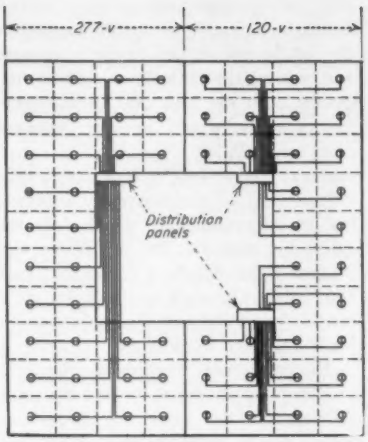


FIG. 3—EACH FLOOR is divided in half for comparative purposes, between 277-volt and 120-v illumination. Number of required panels and circuits is doubled for the lower-voltage system.

40 miscellaneous fan and pump induction motors ranging in size from 1 to 20 hp, totalling an additional 280 hp.

Each typical floor has three 5-hp fans and 12 half-horse circulating pumps.

The 20th floor contains 57 assorted fan and circulating pump motors ranging between ½ and 25 hp, totalling 245 hp.

And the penthouse contains 14 elevator motors, each rated at 90 hp, plus six 25-hp cooling tower pump induction motors and 28 fan motors, ranging in size from 1 to 10 hp. These miscellaneous units in the motor room total 280 hp.

This listing of motors is typical for an office building of this size and, although the size of individual units might vary from structure to structure, the total loads would closely approximate the above.

As to layout of typical floors, Fig. 2 indicates a total floor area of 40,000 sq. ft., with 20% of this total located in the center, occupied by stair wells and service shafts, elevator enclosures and other nonrentable space. The rentable remainder, totaling 32,000 sq. ft., is divided into 64 equal areas measuring 20-by-25 feet, each of these 500 sq. ft. requiring 2 kva for lighting (4-w/sq ft). Each typical floor, therefore, has a 128-kva lighting load and an additional 48-kva miscellaneous load to be served by floor receptacles.

For comparison, each typical floor has been equally divided (Fig. 3), one half using 277-volt lighting and the other using 120-volt illumination. Each half floor totals 16,000 sq. ft. and has a total electrical load of 88 kva. Riser shafts and distribution panels are located in the corners of the nonrentable area, with one 480Y/277-volt riser serving each half floor using 277-volt lighting, and two risers serving the lower-voltage half. The additional riser for 208-volt service is necessary due to branch-circuit voltage drop, which would amount to 3½% if only one riser were installed to serve each floor of the building.

Since we have allotted 2 kva for lighting each 500 sq. ft. area, each area lighted by 277-volt equipment would draw 7.2 amps. Two typical areas would total 14.4 amps and, therefore, the half floor could be satisfactorily served by 16 feeder circuits of No. 12 2/c wire. Circuit lengths would total 1780 feet and, assuming that wire is installed in conduit at $2 per foot (including labor, material, connections to panels and overhead), the total cost for installing 277-volt circuits would be $3560 per half floor.

Conversely, each 500 sq. ft. of area lighted at 120 volts requires 16.7 amps, calling for an individual No. 12 2/c circuit, or a total of 32 circuits for each half floor. These circuits would total 2120 ft. in length and would involve an installed cost of $4040 per half floor.

Therefore the first saving to be realized by using 480Y/277-volt distribution is in the amount of branch circuit capacity required to serve each typical load area.

After loads throughout the building have been established, riser sizes may be selected and, in this typical building, it is assumed that two separate groups of risers will be used—one to serve all loads above the basement, and the other to supply power to the sub-basement electrical equipment.

Using a diversity factor of 0.8 for all lighting and miscellaneous loads, 0.6 for all motors except elevators, and 0.2 for the 14 penthouse units, the total demand above the basement level is 3622 kva. This is equal to 4550 amps for the 480Y-277-volt system (based on 460-volts), and equal to 10,070 amps at 208Y/120 volts. Therefore, two 2500-amp risers would be required to serve the load at 480Y/277 volts, while four 3000-amp risers would be required to serve this same load at 208Y/120 volts. In this selection, riser sizes have a 10% excess-capacity allowance for future additional loads.

Using a diversity factor of 80% for all equipment located in the sub-basement (air conditioning and miscellaneous pump motors) results in a total demand of 2480 kva which is translated into approximately 3110 amps at 480Y/277 volts and 6900 amps at 208Y/120 volts. This would call for either two 1600-amp or two 4000-amp busways, depending on the voltage system installed.

Division of Unit Areas

For comparative purposes, let us now consider service to tenants at different voltages and under various tenant-density plans such as for either one or three tenants being served by 480- or 208-volt feeders from the basement level (Fig. 4).

With a single tenant having 480Y/277-volt service (4-A), equipment might include a 2500-amp busway building riser, a short 5-ft. length of plug-in busway (providing facilities for the addition of future loads), a 200-amp plug-in switch with 150-amp silver-sand fuses as current-limiting primary protection for the other equipment, space for utility company meters, a 17-circuit 277-volt fused panel board (one circuit going to the dry-type transformer, the remainder serving as 277-volt lighting feeders), and a 25-kva single-phase dry-type 480-120/240-volt transformer serving a 32-circuit 120-volt circuit breaker panelboard.

This typical assortment of equipment would have a material cost amounting to $1395, an installation charge of $325 and a total installed cost of $1720.

With three tenants occupying the same space (still served from a 480Y/277-volt primary—Fig. 4-B), the components would be the same, although their capacities would be approximately one-third and items such as switches, transformers and panelboards would be three each rather than one, resulting in three times the equipment, but smaller in size. It will be noted from the sketch that plug-in busway has been recommended to accommodate the additional tenants. This new bill of material would cost approximately $2000. It would have an installation charge of $470 and a total billing of $2470.

Relating these two estimates shows that the saving of $750 would result for each typical floor area occupied by a single, rather than by three, tenants having 480Y/277-volt primary service.

Now, if all tenants were served only by 280Y/120-volt distribution (Fig. 4-C&D), the dry type transformers could be dispensed with and, since it is the practice to use cable for standard tap-offs, the plug-in busway would also be eliminated. The components required for a single, vs three tenants, therefore, would be 250MCM RH cable (5 ft vs 15 ft), safety switches (1 200-amp unit vs 3 100-amp units). Panelboards (1 32-circuit unit vs 3 22-circuit units) and NEC fuses (3 150-amp items vs 9 60-amp items). In these cases, the

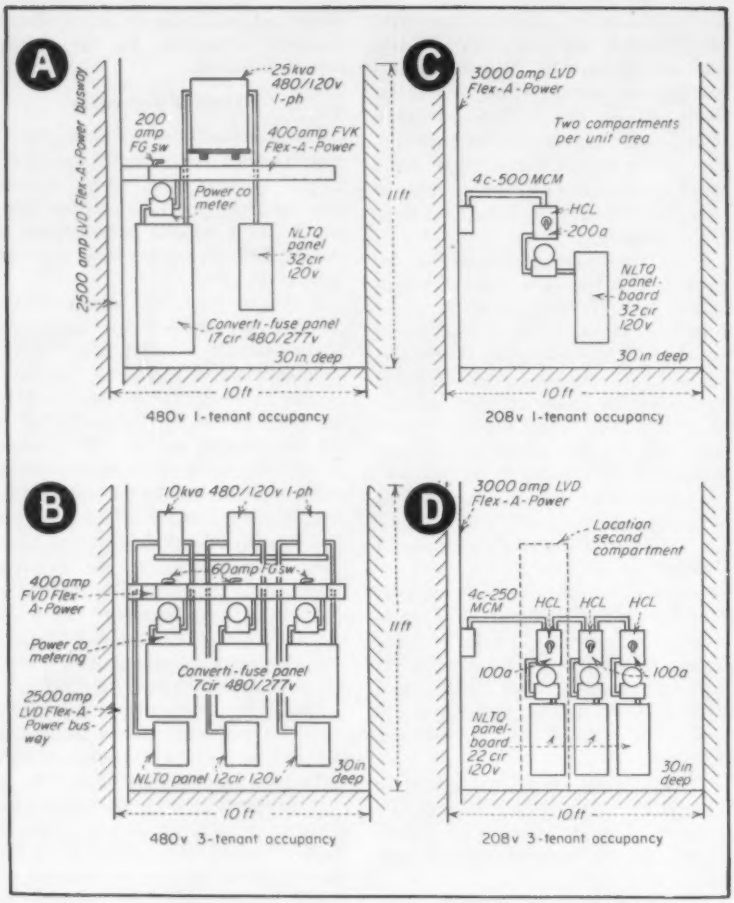


FIG. 4—SERVICE EQUIPMENT for tenant space varies with the number of tenants and level of voltage being considered. Items of electrical equipment become smaller in capacity but more numerous as number of tenants increases.

installed charges for a single- vs a 3-tenant switchgear installation would be $272 vs $591.

Primary Service

As indicated in Part I of this discussion, the greatest saving to be obtained with a 480Y/277-volt system is in entrance switchgear and risers for, as shown in Fig. 5-A, only two circuit breakers, rated 4000 amps with 100,000-amp ICs, are required. In this case, breakers are equipped with overcurrent relays having instantaneous trips and operated by CTs located in each of the 2500- and 1600-amp busways. The installation would also include approximately 820 ft. of 2500-amp and 100 ft. of 1600-amp busway, two 2500-amp and four 1600-amp switchgear entrances, plus necessary tees and elbows. Material in this instance would cost $89,700, installation about $22,440, and total installed cost around $112,200. This charge would cover all busway through the building except the previously-mentioned, plug-in sections in each wiring closet.

With a 208-volt service (Fig. 5-B), the power company would be required to install six entrances, four rated for 3000 amps and the remaining two at 4000 amps. Individual breakers would also be required for each riser shaft, four rising through the building and two dropping to the sub-basement. In addition, the installation would call for 1640 ft. of 3000-amp and 100 ft. of 4000-amp busway, four 3000-amp and four 4000-amp switchgear entrances, plus the necessary forming elbows and 80 cable tap boxes (four per floor). Equipment would cost $217,250, installation charges would approximate $54,325, and the total installed cost would be $271,575.

Motor Installation

Although motors are scattered through the building, let us assume for comparative purposes that all motors except typical floor loads and the 500-hp compressors are served through control centers, four located in the sub-basement, one in the penthouse and one on the 20th floor. These, together with the four 500-hp compressor controls, would involve installed costs of $126,100 (for 480Y/277-volt service) and $174,750 (for 208Y/120-volt power). This wide price differential is understandable when it is recalled for example, that a NEMA size 2 starter will handle a 25-hp motor at 480 volts, although it is rated only for 15 hp at 208 volts, a reduction in rated capacity of 40%.

As previously mentioned, the cost of motors operating at the two different voltages is the same for capacities below 500 hp, although units from this capacity upwards favor the higher voltage level. For example, a 500-hp motor for 480-volt service would cost $6600, while the same unit for 208-volt operation would cost $7275.

Still another differential cost can be found in connection with motor leads, since a 208-volt motor requires approximately twice the current than does an equivalent 480-volt drive. To illustrate, let us assume that the average motor lead (from control center to motor) is 40 feet of 3/c cable, and that cables will be sized at 150% of motor current rating for safety. We know that the building's total connected motor load is 5000 hp, so, when we convert this to amperes, the load is 6000 amps at 480 volts and 13,900 amps at 208 volts. These load values, when multiplied by the 1.5 cable safety factor and the 40-ft. lead per motor, become 360,000 amp-ft at 480 volts, and 834,000 amp-ft at 208 volts. When again multiplied by the installed cost of $0.015 per amp-ft (obtained from experience), the charges for installing motor leads become $5400 for 480-volt motors, and $12,510 for 208-volt motors.

Cost Comparison

As tabulated in Table I, the cost for installing a 480Y/277-volt system in our typical 20-story office building would be $500,800, while a 208Y/120-volt installation would cost $672,517. The 208Y/120-volt installation charge could be lowered $6,500 by omitting the reactors in the motor control centers (installed to reduce the duty on the centers to within their normal ratings), and an additional $27,500 could be cut by using fused pressure switches instead of air circuit breakers. Although elimination of these items is not recommended on actual 208Y/120-volt installations, but are common practice, the resulting reduction in the cost of a 208Y/120-volt system would still

be well above that of a 480Y/277-volt installation, and the higher voltage installation would still show a saving of $137,717. Expressed in terms of the 6000-kva building demand, this saving is $23 per kva. And, expressed in practical cents-per-net-square-foot terms, the saving at 480Y/277 volts in the 20-story building would be approximately 21½ cents/net sq ft. of floor area.

Since many commercial buildings have steam available for driving their large air conditioner compressors, we can further reduce our comparative costs by eliminating the 500-hp motors and their related controls, and reducing the sizes of entrances and busways. This revision would show a total reduction of $81,500 for the 480Y/277-volt system, and $102,025 for the 208Y-120-volt system. This indicates that a saving of $20,525 was realized through the use of 480-volt electrical compressors, and it also shows that, even with air-conditioning compressors eliminated, the total remaining saving of $117,192 still represents a differential between the two systems of $26.1 per kva (based on a revised demand of 4500-kva) or 18.3 cents/net sq ft of building area.

Cable vs Busway Risers

In the foregoing analysis, busway risers were selected because they readily lent themselves to a dual-voltage cost comparison and their specification is not intended as an argument of their merit over other riser systems—such as cable-conduit or varnished-cambric interlocked armored cable.

However, to prove that the same relative high savings can be realized with other types of risers as well, a cable-conduit installation can also be considered. Then the entrance switchgear would be increased to include not only entrance breakers but necessary feeder breakers as well; and, for the 480Y/277-volt system, approximately 22,000 ft. of 500MCM single conductor cable in parallel per phase would be required to serve the 400-amp load blocks. At $2.27 per circuit-foot, this cable would cost approximately $50,000. Entrance switchgear would cost an additional $50,000, resulting in a combined switchgear-riser cost of $100,000.

At 208 volts, the necessary 500MCM cable would total 58,000 feet and, at $2.27 per circuit foot, would approximate $131,600. Switchgear would approximate an additional $115,500, so that the 208-volt switchgear-cable combination would total $247,100.

Therefore, by using this alternate method for primary distribution, the saving in favor of the higher voltage for switchgear and risers would be approximately $147,100. This compares favorably with the $159,370 differential found in our initial study.

TABLE I—COST COMPARISON

	480Y/277	208Y/120
Wiring 40 half-floor areas	$142,400	$161,600
Panelboards and transformers		
14 unit areas with 1 tenant	24,080	7,616
26 unit areas with 3 tenants	64,220	15,366
Entrance switchgear and risers	112,200	271,575
Motor control centers	126,100	174,750
Air conditioning motors (4-500-hp)	26,400	29,100
Motor feeders	5,400	12,510
	$500,800	$672,517

40- and 10-Story Buildings

For simplicity, let us now consider an office building of 40 floors having the same configuration, the same ground and floor plans, and the same types of tenancy and lighting.

Following the same basic analysis as that which was detailed for the 20-story building, we find that the total demand for the 40-story structure is 9000 amps above the basement and 6000 amps below the basement with a 480Y/277-volt system, and it is 20,800 amps above and 13,500 amps below for the 208Y/120-volt installation.

Space would not permit a second detailed analysis of cost increments, but such a study would show a total installed charge of $1,105,110 for the 480Y/277-volt system in the 40-story building and $1,490,750 for the 208Y/-120-volt installation. By omitting reactors at 208-volt motor control centers and using fused pressure switches for the 208-volt entrance, the second figure can be reduced to $1,422,750, showing a net differential of $317,640 and savings of $26.5 per kva (based on a 12,000-kva load) and 24.8 cents/nsf by adopting the higher voltage level for primary distribution. It can be seen from this that, as the structure rises in height and bus risers are extended, savings associated with the higher voltage become greater.

For a final comparison between 480/277-volt and 208Y/120-volt systems in commercial structures, a 10-story building, still having the same floor plan and tenancy characteristics, can be considered. The study will show a net saving of $104,520 at 480Y/277 volts, an approximate saving of $17.3 per kva, and a saving per net square foot of 16.3 cents. It will be noted that these savings are somewhat less than those in the two preceding instances, yet they are still sufficiently large to merit serious consideration in favor of a 480Y/277-volt installation.

These cost comparisons have considered hypothetical buildings and were based on installation charges which in all probability would differ with local conditions throughout the country. Therefore the indicated savings are admittedly subject to variation. It remains our contention, however, that the analysis presents many arguments in favor of the commercial adoption of previously-proved industrial high-voltage distribution practices.

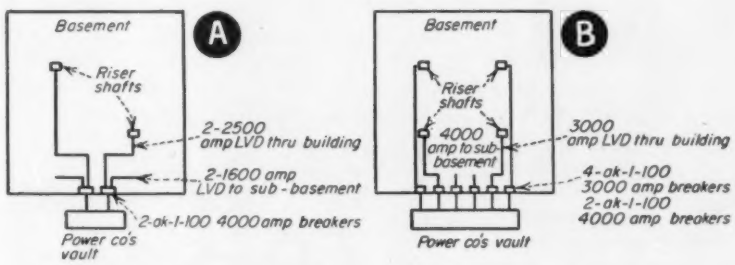


FIG. 5—ENTRANCE SWITCHGEAR AND RISERS for a 480Y/277-v system show major savings in this economic study. Note that one set of feeders serves all sub-basement equipment while another set carries power to all upper floors.

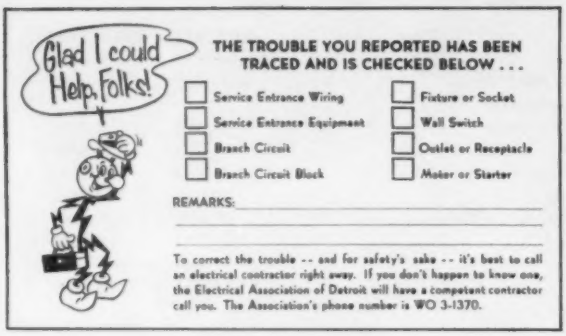

Glad I could Help, Folks!
THE TROUBLE YOU REPORTED HAS BEEN TRACED AND IS CHECKED BELOW . . .
Service Entrance Wiring
Service Entrance Equipment
Branch Circuit
Branch Circuit Block
Fixture or Socket
Wall Switch
Outlet or Receptacle
Motor or Starter
REMARKS:
To correct the trouble -- and for safety's sake -- it's best to call an electrical contractor right away. If you don't happen to know one, the Electrical Association of Detroit will have a competent contractor call you. The Association's phone number is WO 3-1370.

FIG. 1. TROUBLE-CALL CHECK CARD left with customer by utility service man is constant reminder that serious electrical trouble should be corrected by a contractor. Customer can call the Detroit Electrical Association and have a plan-contractor assigned.

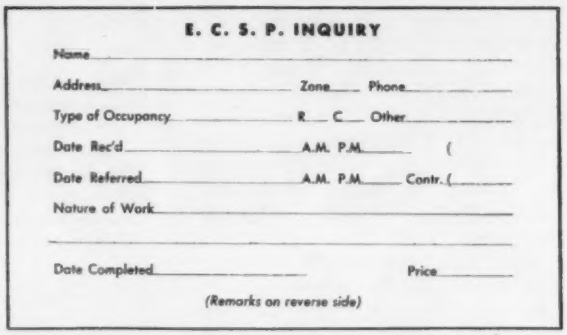

E. C. S. P. INQUIRY
Name
Address Zone Phone
Type of Occupancy R C Other
Date Rec'd A.M. P.M. (
Date Referred A.M. P.M. Contr. (
Nature of Work
Date Completed Price
(Remarks on reverse side)

FIG. 2. INQUIRY FORM is filled out in triplicate at central office when customer call (initiated by Trouble-Call Check-Card) is received. Original goes to assigned contractor; duplicate to central file; triplicate to Joint Council of Electrical Contractors. Postal Zone is assignment key.

DETROIT'S ELECTRICAL CONTRACTORS'

Services Program

. . . taps the residential market, speeds trouble call service, helps upgrade home wiring. Contractor originators of plan convert into jobs 80% of inquiries channeled through the local Electrical Association as program administrator.

By Herbert E. Cook *Executive Secretary, The Electrical Association of Detroit, Detroit, Michigan*

Value of the Electrical Contractors' Services Program

TO CUSTOMERS —

Provides a service when electrical problems arise
Gives reasonable assurance of good workmanship
Promotes goodwill
Establishes the Association as an industry representative
Engenders a feeling of confidence in industry representatives

TO CONTRACTORS —

Increases business volume
Produces new sources of business with no expense
Enhances his standing through endorsement
Presents opportunity for securing additional business
Produces a "sense" of "belonging" and feeling of responsibility

TO THE UTILITY —

Provides a source of service to its customers
Reduces faulty conditions
Relieves it of referral responsibility

A CONTRACTOR-CONCEIVED residential service plan now makes it simple and easy for Detroit homeowners to have their electrical system troubles corrected promptly. In the process, general status of home wiring is being improved; customers are avoiding serious electrical difficulties; contractors are getting business which normally might have gone by the boards.

More than a year ago, a group of 25 residential electrical contractors (The Thomas Edison Club) organized the Electrical Contractors' Services Program. Its operation is based on three premises: (1) the best way to get residential wiring business is through cooperative effort; (2) the best time to talk better wiring occurs when a prospect has electrical trouble; (3) the best pool of good "leads" is the daily list of "trouble calls" received by the local utility.

As a rule, utilities will not recom-

mend specific contractors or contractor groups. They merely suggest that a customer "consult an electrical contractor" to correct wiring troubles. The Detroit program respects that policy and leaves the decision entirely up to the customer. Administration is under the supervision of an Advisory Committee composed of representatives of the Detroit Edison Company, The Electrical Association of Detroit and the contractor group (an Electrical Association member). To operate the plan, the contractors sought—and received—the cooperation of the Electrical Association which acts as a clearing house for calls, dispatches the "leads" and handles the administrative paper work. Details concerning installation, extent of work, price and terms of payment are settled between contractor and customer. For statistical purposes, contractors return a referral form noting if and when the work was completed. Inclusion of price is voluntary and suggested only as a means of placing an approximate dollar volume on the success of the plan.

Mechanics of the Program

Operation of the plan is simple. Calls from customers in electrical trouble originally come into the utility and a service man responds. If the trouble is more serious than just a blown fuse, the service man investigates the cause and notes it on a special trouble-call check card (Fig. 1) which he leaves with the customer. The card suggests that this trouble be corrected —*for safety's sake*—by calling an electrical contractor. If the customer doesn't know a contractor, he is urged to call the Electrical Association of Detroit (telephone number indicated) which will have a competent contractor call in person. This is the initial step in the service plan. The next move is up to the customer. If he calls the Association, the program takes over in the following manner:

1. Electrical Association personnel receiving the phone call transfer pertinent information to a special E.C.S.P. form (Fig. 2) made out in triplicate. Special attention is paid to type of occupancy, nature of work and postal zone address. The customer is advised that an electrical contractor will call within 24 hours for an appointment to investigate the job and discuss details.

2. The call is assigned to a contractor (taken from a master list of plan members) who operates in the same postal zone area as the customer.

3. The original (white) inquiry form is mailed to the assigned contractor who is pledged to follow up within 24 hours after receipt of the form. If he cannot, he notifies the Association office and the inquiry is assigned to another contractor in the same or adjacent postal zone area. Contractors who fail to act within the specified time lose the "lead" and stand to lose their status as a plan member.

4. A second copy of the inquiry form is put into the central "incomplete" file at the office. A third copy is filed with the Joint Council of Electrical Contractors to which plan members belong.

5. Return of the original inquiry form with completion date noted marks the final step of the plan procedure. This, plus the central file copy, are then transferred to the "completed" file and retained for record purposes.

Impartial allocation of inquiries (or active leads) on a Postal Zone basis is used to cut contractor travel time and overhead. Calls are rotated between members located in the same zone. Inquiries from areas which have no established contractor are directed to—and rotated between—plan members in neighboring zones. Program contractors are established in 12 of Detroit's 32 Postal Zones. To date 20 members have received calls from these areas and five have done work in two suburbs.

Program a Success

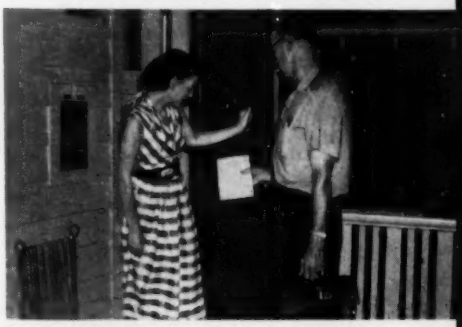
Although the program was first initiated on a more or less experimental basis, it has been so successful that the contractors decided to continue it. What they liked most is the way it taps the residential market for them without any pavement-pounding and doorbell ringing on their part. And the leads it supplies are names of prospects in a receptive mood—an advantage in selling wiring modernization.

Evidence that the Detroit group has been "on the ball" lies in the record. During a 12-month period, some 2,500 calls were channeled through the central office. Of these, the contractors converted 2,000 leads into firm orders for wiring jobs.

Based on voluntary price information received from plan members, the average price per job was about $43 —or a total volume of $86,000. This represents a substantial block of "plus" business (most of it installed on a "fill-in" basis) for the 25 contractors who originated the program. Equally important is the fact that they have 2,000 new, satisfied customers on their books who represent an additional, readily accessible market for the promotion of better wiring and more electrical living convenience.

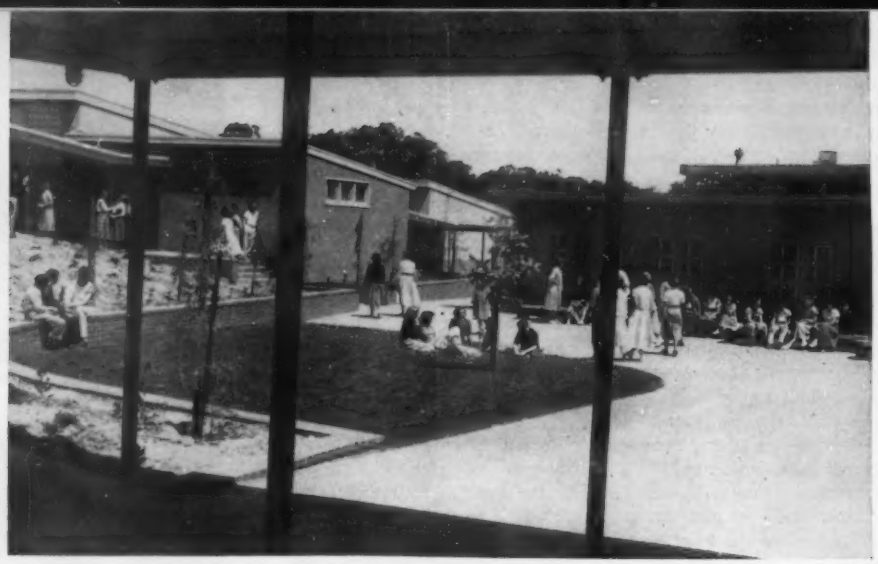
CUSTOMER CALLS come into the central office at rate of 165 per month. Pertinent information is noted on special E.C.S.P. inquiry form and contractor assigned in same Postal Zone.

DUPLICATE COPIES of inquiry forms are filed in "incomplete" file until original is returned by contractor. Both are then transferred to "completed" file or cancelled, as indicated by contractor.



CONTRACTOR FOLLOWS UP inquiry with personal call, discusses job with customer and comes away with an order. Some 2,000 jobs resulted from 2,500 calls channeled to contractors.

POSTAL ZONES outlined and marked on large city map (pointed up by program administrator H. E. Cook) are the key to impartial assignment of "leads" to plan contractors.



Installation and construction details on . . .

Modern School Wiring

Modern, functional, electrical distribution and application highlight construction of multi-building type school in Burlingame, Calif.

By James L. Dellos

Engineer, Emil J. Weber Electric Co.
San Francisco, Calif.

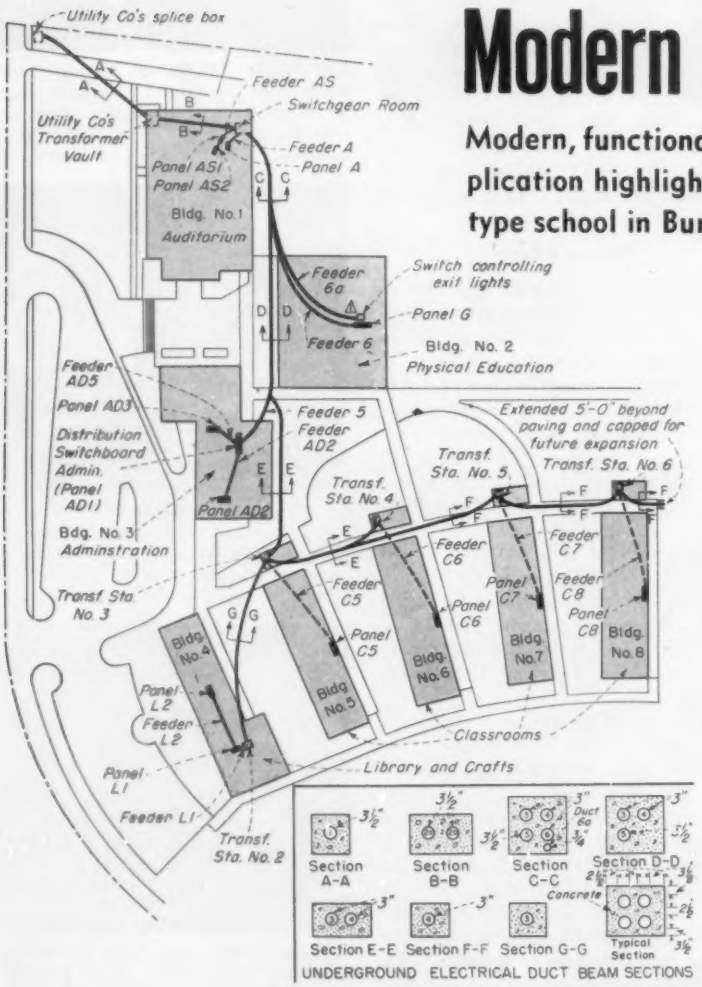


FIG. 1—Plot plan of school, showing underground distribution layout and concrete envelopes for cement-asbestos duct runs to panels and transformers.

OVERALL electrical construction represents a wealth of installation and application details in Burlingame Intermediate School, Burlingame, Calif. From the methods used on 480-volt underground distribution and layout of outdoor lighting to the installation of interior light and power systems, electrical work in this 8-building, one-level school includes a wide range of the elements of modern school wiring.

A firm foundation for the whole electrical system is 480-volt underground distribution between a utility transformer vault in the auditorium building and transformer load centers serving the various buildings (Figure 1). From a utility company handhole near the NE corner of the school property, a 3½-inch duct was installed underground to a utility company

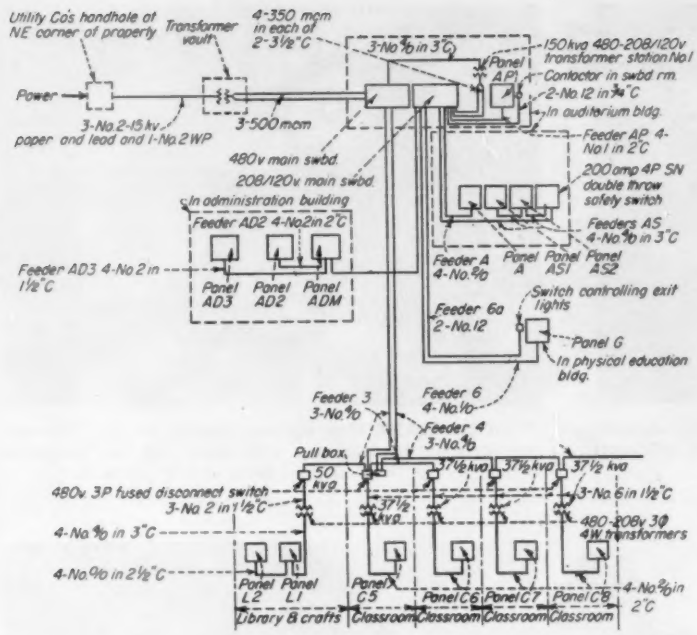
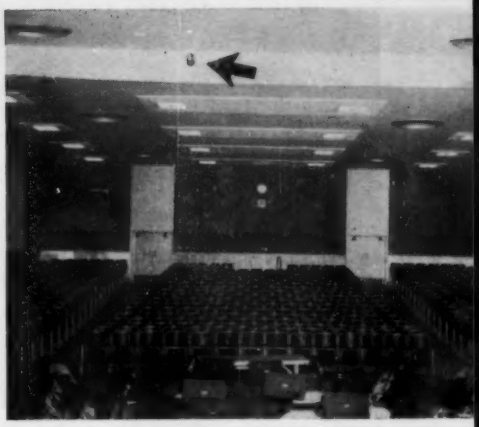


FIG. 2—Single-line diagram of distribution (notation of feeders corresponds to plot plan).



SCHOOL AUDITORIUM occupies one building; is lighted by sixteen (four rows of four) recessed silver bowl units, with one-piece steel reflectors, hinged metal louvers and one 300-watt silver bowl lamp mounted in a ring in the center of each fixture. Orchestra area is lighted by 6 recessed hi-hat units. Four stage-focusing spotlights (not shown) are mounted above orchestra. Two 300-watt adjustable beam lamps (one shown at arrow) are recessed in ceiling rise and are equipped with color lenses, louvers and removable grid.

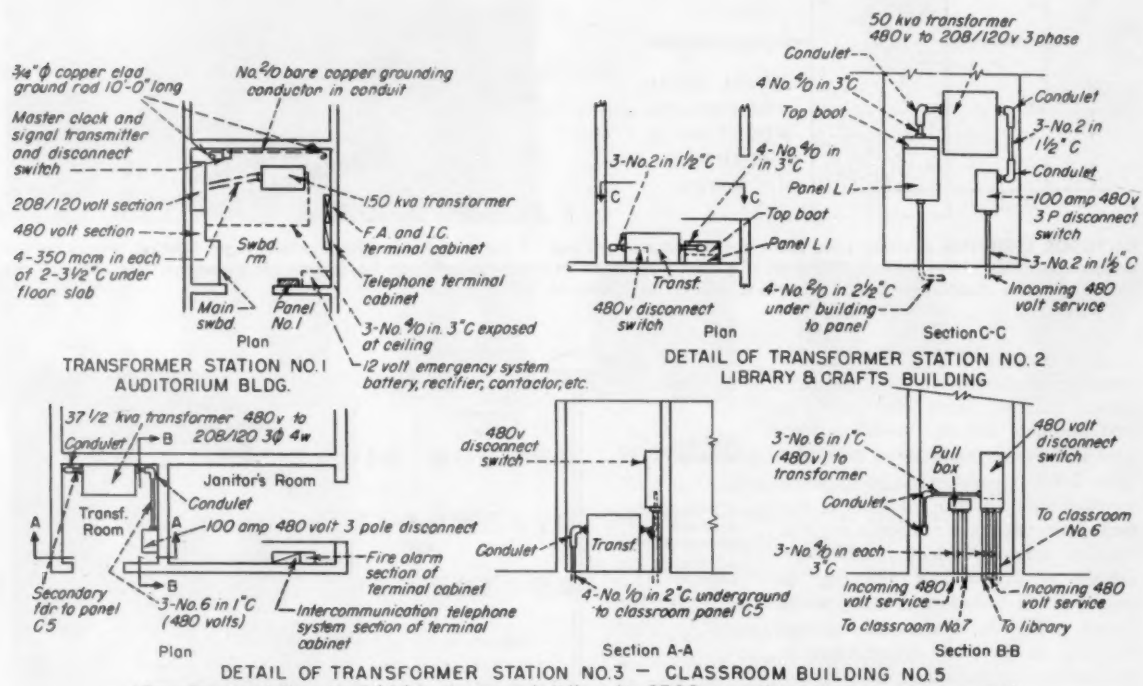
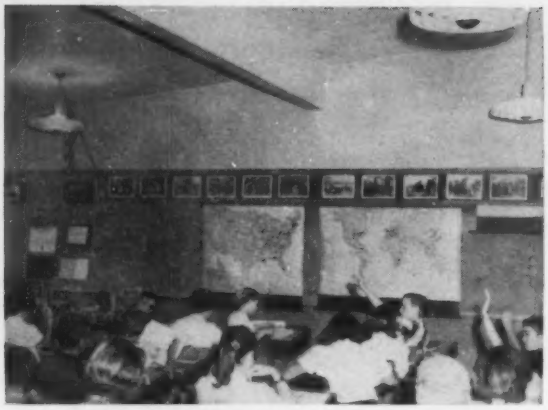

¾"ϕ copper clad ground rod 10'-0" long
No.2/0 bare copper grounding conductor in conduit
Master clock and signal transmitter and disconnect switch
208/120 volt section
480 volt section
4-350 mcm in each of 2-3½"C under floor slab
Swbd. rm
Main swbd
Panel No.1
150 kva transformer
F.A. and I.C. terminal cabinet
Telephone terminal cabinet
3-No.4/0 in. 3"C exposed at ceiling
12 volt emergency system battery, rectifier, contactor, etc.
Plan
TRANSFORMER STATION NO.1 AUDITORIUM BLDG.
50 kva transformer 480v to 208/120v 3 phase
Condulet
4 No.4/0 in 3"C
Top boot
3-No.2 in 1½"C
4-No.4/0 in 3"C
Panel L 1
Transf.
480v disconnect switch
4-No.2/0 in 2½"C under building to panel
100 amp 480v 3 P disconnect switch
Incoming 480 volt service
Plan
Section C-C
DETAIL OF TRANSFORMER STATION NO. 2 LIBRARY & CRAFTS BUILDING
37½ kva transformer 480v to 208/120 3ϕ 4w
Janitor's Room
Transf. Room
100 amp 480 volt 3 pole disconnect
Fire alarm section of terminal cabinet
Secondary fdr to panel C5
3-No.6 in 1"C (480 volts)
Intercommunication telephone system section of terminal cabinet
480v disconnect switch
Transf
4-No.1/0 in 2"C underground to classroom panel C5
3-No.6 in 1"C (480v) to transformer
Pull box
480 volt disconnect switch
To classroom No.6
3-No.4/0 in each 3"C
Incoming 480 volt service
To classroom No.7
To library
Plan
Section A-A
Section B-B
DETAIL OF TRANSFORMER STATION NO.3 — CLASSROOM BUILDING NO.5
(Transformer stations No.4,5&6 in classroom buildings No.6,7&8 respectively, similar except as noted)

FIG. 3—Layout and mounting details at transformer stations.

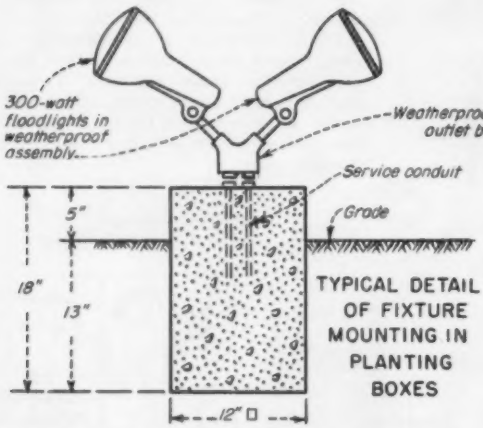
transformer vault in the corner of the auditorium building. This duct and all other underground duct is standard weight cement asbestos, concrete encased, buried 2 feet to the top of the concrete. From this duct, a rigid conduit ell was stubbed up 6 inches in the utility vault. Three No. 2, 15-kv paper and lead and one No. 2 WP conductors were pulled in this duct.

From an 800-amp, 480-volt secondary copper busway in the utility vault, two sets of three 500 MCM are carried in separate ducts under the floor of the auditorium and up to the main 480-volt switchboard in a room on the other side of the building. From the switchboard, 3-phase, 480-volt power is delivered to six transformer stations where it is stepped down to 120/208 volts, 3-phase, 4-wire for utilization.

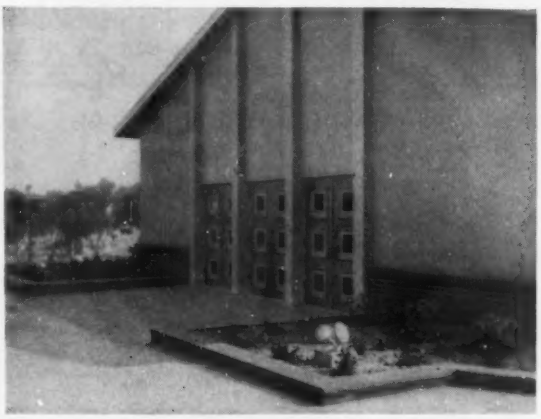
GYMNASIUM in physical education building has skylights to utilize daylight; is artificially lighted by 32 300-watt incandescent, ventilated low-bay lighting units.



TYPICAL CLASSROOM lighting consists of six 750-watt, indirect silver bowl lighting units, each with four concentric shielding rings, a silver bowl lamp and mogul socket.



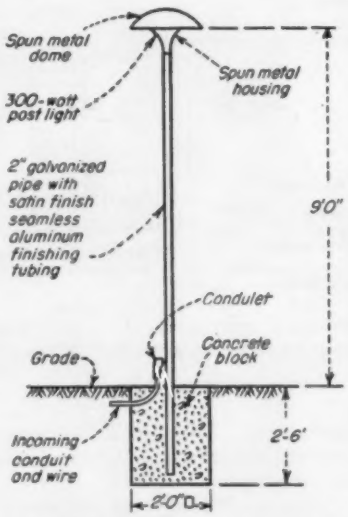
TYPICAL DETAIL OF FIXTURE MOUNTING IN PLANTING BOXES



OUTDOOR LIGHTING is widely used about the landscaped grounds of the school; provides dramatic night lighting effects on the various buildings. Here pair of 300-watt, PAR-56 floodlights in weatherproof lensed assembly are shown on both sides of the entrance to the auditorium (right). Mounting details are shown at left.

As shown in Fig. 2, 480-120/208 transformer station No. 1 in the auditorium building feeds local panels in that building and in the administration and physical-education buildings. The Library-and-Crafts building is supplied from another transformer station; four classroom buildings are also supplied from individual transformers. Details of layout and mounting of equipment in transformer stations are shown in Fig. 3. Transformer station No. 1 is in the switchboard room in the auditorium building; transformer station No. 2 is in the Library-and-Crafts building. Each of the transformer stations 3 through 6 is located in a corner of a lavatory adjoining the classroom which the transformer serves.

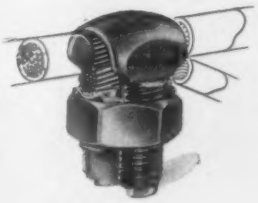
Keller and Gannon were consulting engineers on this job; Hertzka and Knowles were the architects. Both firms are of San Francisco, Calif.



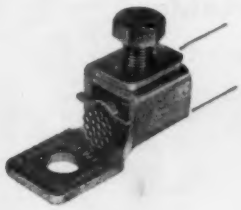
MOUNTING DETAILS of typical outdoor post-light which is used around the grounds.

FLOODLIGHTS (arrow) on under side of eave of building are 300-watt, PAR-56 units in weatherproof, lensed assembly.

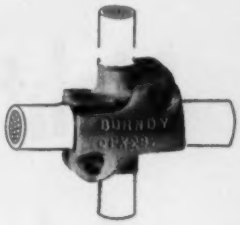
for CONNECTORS...



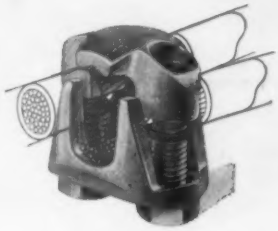
SERVIT



SCRULUG



VERSITAP



OKLIP

QIKLUG

HYLUG

IT ALWAYS PAYS TO CONSULT

BURNDY

YOUR BASIC SOURCE FOR LATEST DEVELOPMENTS IN ELECTRICAL CONNECTORS

REPRESENTATIVES
AND DISTRIBUTORS
IN PRINCIPAL CITIES

With more than 30,000 individual Burndy connector designs—Burndy is ready to serve your connector needs promptly, efficiently. 70 graduate engineers will help you solve any connector problems in joining, terminating, clamping, or grounding every size and type of electrical conductor.

Burndy connectors and tools provide maximum mechanical strength and electrical efficiency —at low installation cost. Write for free technical counsel or catalogs . . . to

BURNDY—NORWALK, CONNECT. · FACTORIES: NEW YORK · CALIFORNIA 53-14

A $50,000 Lighting Job!!

"Boloney," you say?...

Not by a long shot...
depends on *how you look at it.*

Actually this job cost somewhere around a thousand dollars . . . and probably is typical of many jobs you've sold. A relatively small job, true... but well engineered.

But where does the $50,000 job come in? As we said before, it depends on *how you look at it.* To be more precise, if you could turn one good job into 50 similar jobs, you could hit that elusive 50 thousand mark. Yeh . . . that's the rub. But how do you turn one job into 50?

Here's how! Enter some of your lighting jobs in the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS. If one of your entries wins an award it will receive a cash prize. But over and above that, first prize winning entries will be published in ELECTRICAL CONSTRUCTION AND MAINTENANCE — as an article. You'll receive 1000 reprints of this article — imprinted with your name — for local sales promotion. And of course you'll receive plenty of local publicity for having won a lighting award.

Added up, a winning entry will put you on the receiving end of a whale-of-a-lot of recognition and local prestige . . . bring enough local lighting business to your door to make $50,000 look like king-size peanuts.

Would you like to test the business-building possibilities of the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS? Just fill-in and return the attached coupon and we'll put you on the road with a rules brochure and some easy-to-fill-out entry forms.

Lighting Competition Chairman
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd Street, New York 36, N. Y.

Dear Sir:
Please send me a copy of the Rules Brochure and.....
Entry Forms for the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS.

NAME _____

COMPANY _____ TITLE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

LIGHT'S DIAMOND JUBILEE LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGRAW-HILL PUBLICATION
330 WEST 42ND STREET, NEW YORK 36

When management says: "Cut operating costs"... here's how we can help you

When management tosses this problem in your lap, the sum total of many factors must be determined. And more than a review of the electrical system is involved.

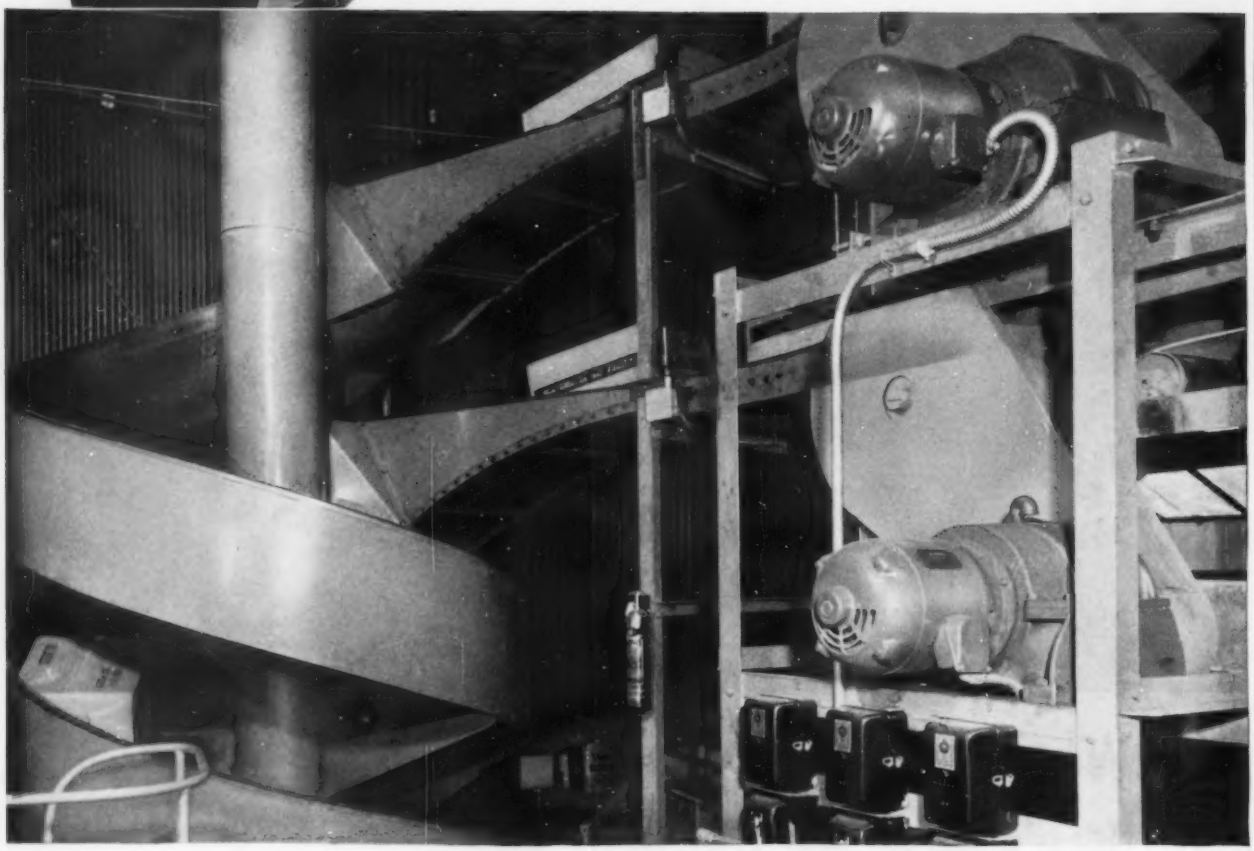
To really lower operating costs calls for an overall analysis—the relationship of power to many other plant areas. In scope, this can run from a review of production methods and machines to a detailed check of maintenance costs and down time.

That's where we, your Westinghouse Distributors, can help. Backed by the Westinghouse engineering and service staff, we offer you an "all-through" plan. From problem analysis *through* system design and equipment, installation and operational proof, we work closely with you to bring about cost-cutting practices.

Specific examples of how we can do this are shown on the next pages. DP-5001-A

YOU CAN BE SURE...IF IT'S Westinghouse

"Look first at the drives behind production equipment . . . here's where costs can be cut."



Motor operating costs down 51.5% after Life-Line® Motor installation

In terms of dollars per year—per 100 motors—a plant survey showed that Westinghouse Life-Line Motors result in a $693.58 operational savings over conventional a-c types.

Yearly outage rate for the conventional motors was $1,348.62. On the 100 Life-Lines, it totaled $655.04. That's a 51.5% slash in motor operating costs.

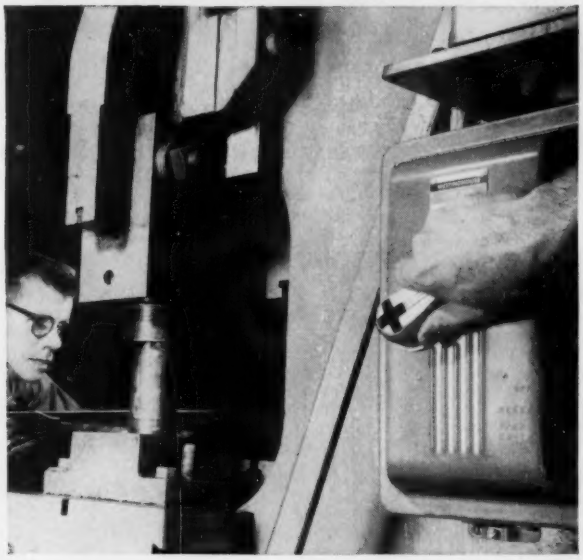
This performance record is due to the greatly improved design and structural materials. In addition, Westinghouse Life-Line Motors require no lubrication. They are equipped at the factory with pre-lubricated bearings—sealed with a lubricant that inhibits oxidation or deterioration.

Once a Life-Line Motor is installed, the plant can forget about periodic greasing. And the motors can be mounted out of the way.

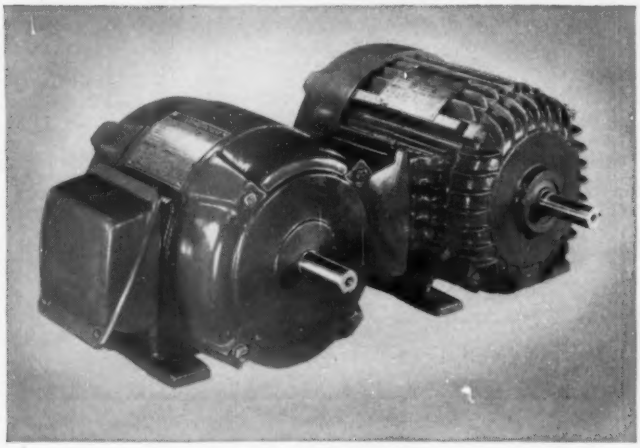
Westinghouse Distributors—with proved Westinghouse engineering backup—can give you many answers on motor costs. DP-5001-B

Here are more concrete examples, showing how intelligently engineered Westinghouse products save time and money for installers and operators . . .

AB-1 circuit breakers provide complete protection against short circuits and high overloads. They can be reset quickly and safely after fault is cleared. Available for practically every NEMA application.



Change-over to AB-1 breakers saved $5319 the first year here. Yearly outage with fuse protection was costing $5408. Westinghouse Circuit Breakers were recommended—dropped outage overhead to $89 . . . a 98% saving.



Life-Line "A"—newest addition to the Westinghouse motor line. Offers the many Life-Line savings and advantages . . . with new features to meet the ever-growing progress of industry. A power package that guarantees better performance.

Control centers provide flexibility for rearrangement of plant production lines. Starter units are interchangeable. And vertical structures can be arranged for any floor requirement—are easy to expand. DP-5001-C

YOU CAN BE **SURE**... IF IT'S

Westinghouse

"From the meter to the load, coordinated Westinghouse products save installation time and operating expense."

By applying Inerteen® Capacitors, power bills dropped nearly $4000

Many plants—like this Midwestern concern—are amazed at how much improved power factor can lower operating costs.

The capacitor bank, here, is one of eight installed. They total 720 kvar and have raised power factor from 69 to 95%. Result: Motor performance improved through better voltage regulation. Power bills have been cut by an average of $315 a month —an annual savings of $3780.

Westinghouse Inerteen Capacitors will bring similar savings wherever inductive equipment is used. They do it by applying nonproductive current direct to the load. This permits more of a system's capacity to carry useful working current. DP-5001-D

YOU CAN BE SURE...IF IT'S Westinghouse

Flexibility of plug-in bus duct speeds relocation of production machines

As part of an expansion program, an eastern plant was relocating its production machines. Further analysis showed how Westinghouse Plug-In Bus Duct would help minimize the job.

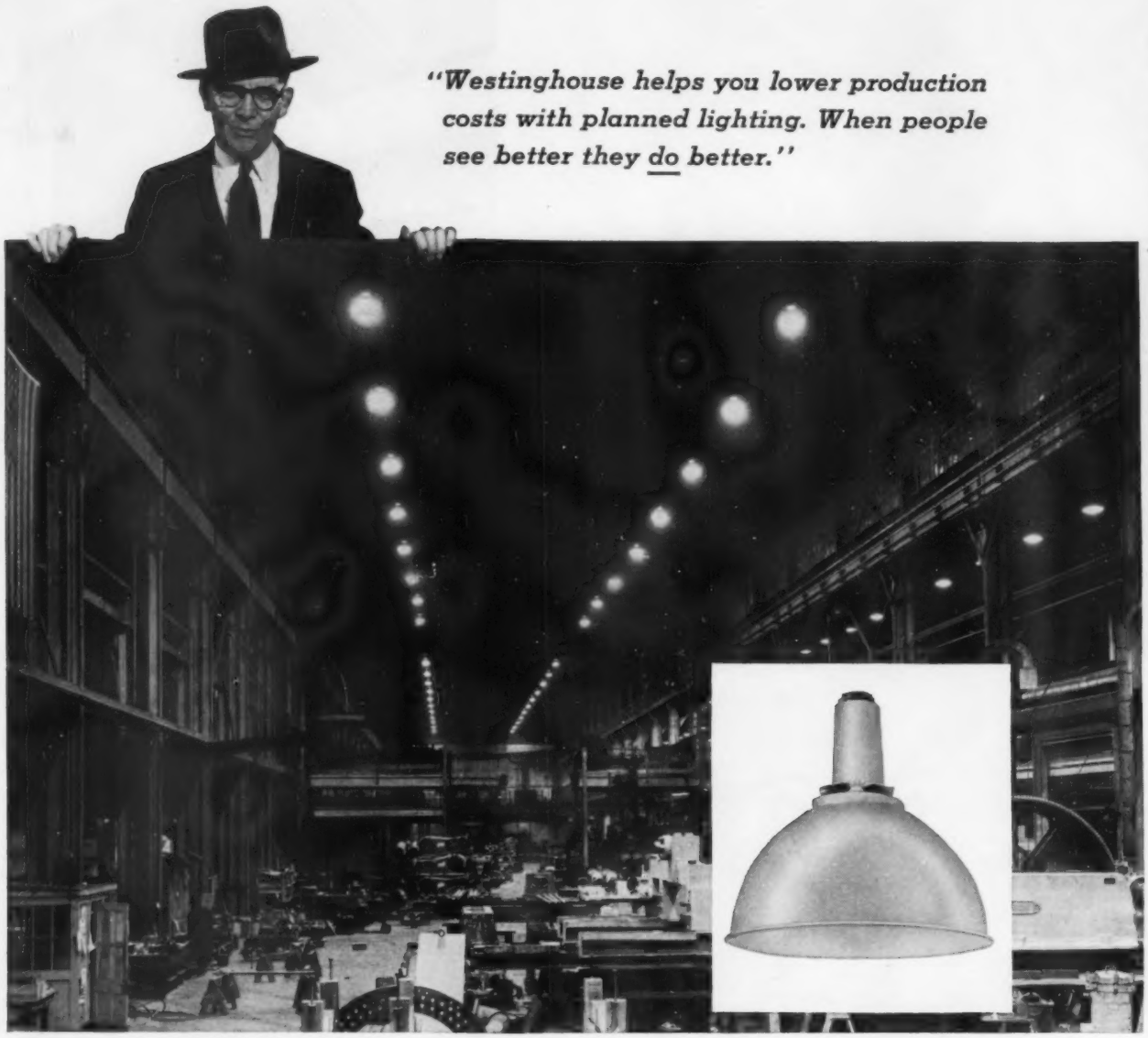
Due to the flexibility of plug-ins every foot, power was taken temporarily from the duct. And the plant moved 139 machine tools with less than five minutes down time per operator.

Up to 10-foot lengths, Westinghouse Bus Duct comes in prefabricated sections. It installs easily with cantilever hangers and can be expanded or relocated. Available in two types that accommodate all load and service requirements.

Installs quickly. Three men using a fork truck installed 755 feet of bus duct in four days at this same plant. Installation savings benefited not only the user but contractor as well . . . resulted in an additional lighting installation.

Power take-offs easy. Here's *how* easy it is to take off power from Westinghouse Plug-In Bus Duct: Slide cover away from plug-in receptacle . . . then plug in and fasten unit to duct. DP-5001-E

And here's how good lighting pays off . . .



Ventilated mercury high-bay fixtures cut maintenance...give more light at no extra cost

The modernization need at this Pennsylvania plant: Better lighting with less maintenance. The answer: A Westinghouse Ventilated Mercury High-Bay lighting system.

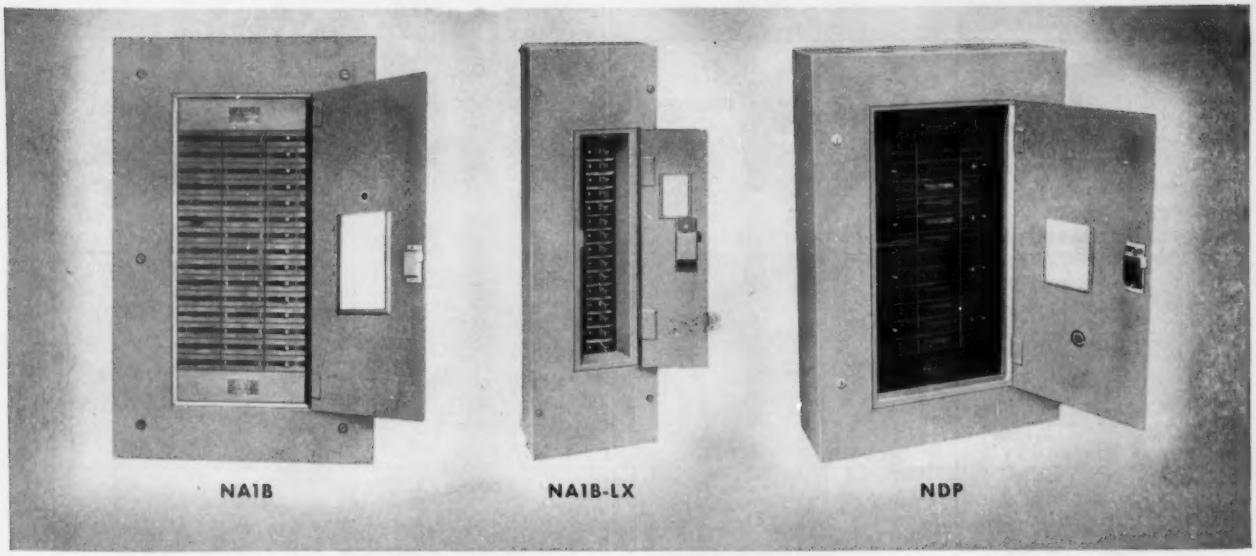
Mercury sources provided approximately three times more light than the previously used incandescent design—and last seven times longer. At a 48-foot mounting height—the case in this plant—this becomes exceedingly important.

Additionally, the ventilated luminaires help keep reflectors clean . . . yet protect the lamps and provide a controlled lighting distribution system to meet the specific application requirements.

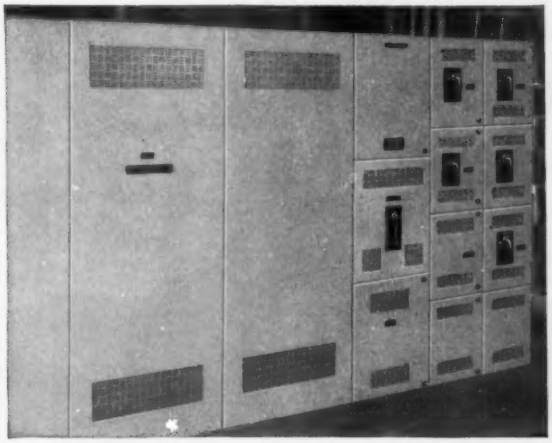
Planned lighting *does* mean economy. The seeing requirement dictates the lighting system and equipment to be used.

Your Westinghouse Distributor stands ready to help you with your lighting problems—whether they involve the shop, office or parking lot. DP-5001-F

Here's more matched Westinghouse equipment: Dry-type power centers to bring high voltage closer to the lighting load . . . and modern circuit breaker panelboards which offer complete protection to lighting circuits . . .

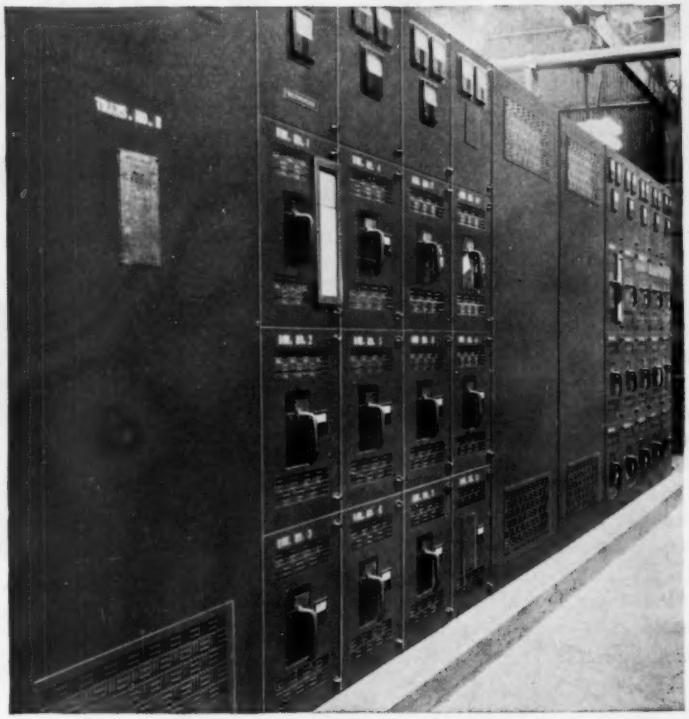


Westinghouse AB De-Ion® Circuit Breaker Panelboards give dependable protection to lighting and power circuits. There is a complete line available for surface, flush or column mounting. Circuit capacities range from 15 to 600 amperes, up to 600 volts a-c or 250 volts d-c in panels with either main lugs or main breakers. They cut down time because there are no fuses to store, match to the circuit or replace. A flip of the breaker handle puts you back in service.
DP-5001-G



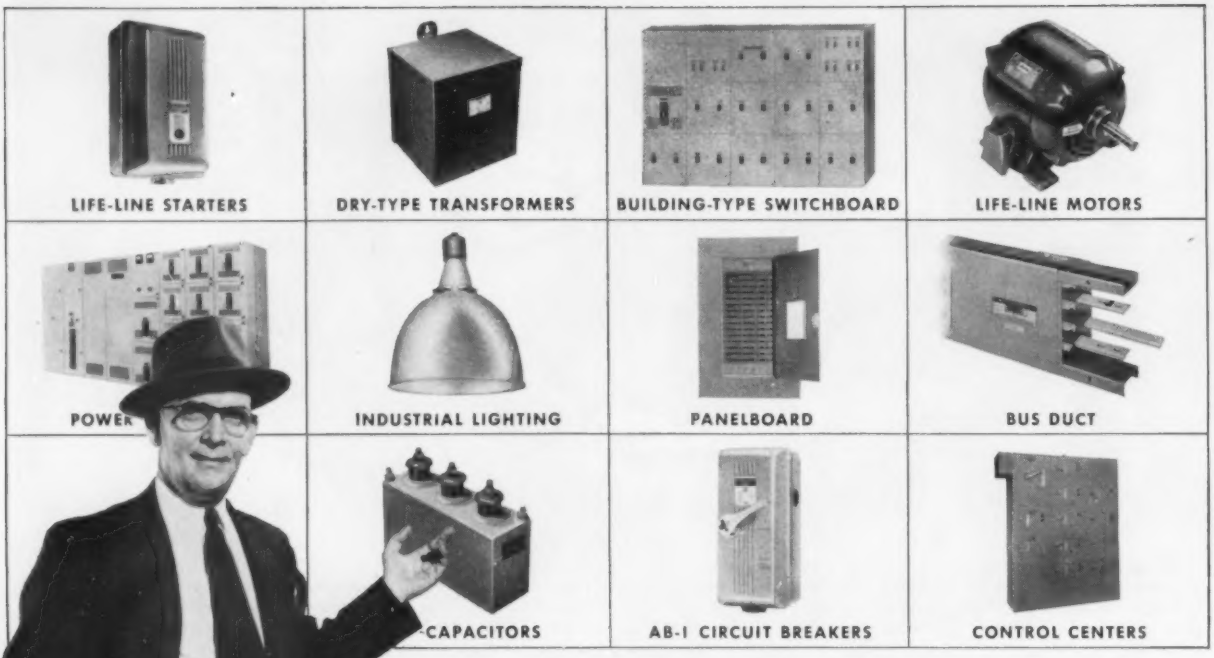
Westinghouse Power Centers assured more production output per kwhr used at an eastern metal-working company. This was brought about by improved voltage conditions and reduced line losses.

Dry-type power centers reduce operating costs. They combine transformer and circuit protecting equipment in a single unit—spotted close to the loads. Secondary runs are shortened; line losses lowered.



YOU CAN BE **SURE**... IF IT'S

Westinghouse



The Westinghouse Distributor in your area offers you a complete electrical service

Regardless of your location, a Westinghouse Distributor is nearby—ready to serve your electrical needs.

He offers you from a single source a complete line of electrical equipment—coordinated Westinghouse products that install easily, feature both simplified and standardized design.

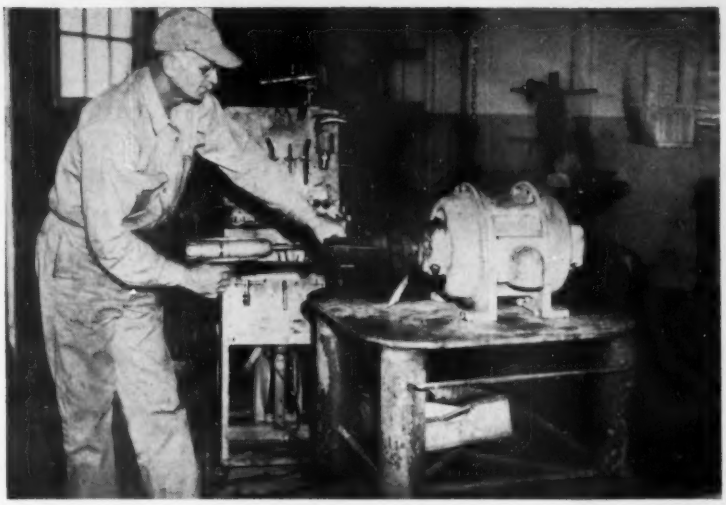
And through your Westinghouse Distributor you can get the engineering and product advice you require to help bring about better, more economical plant operation.

Put these combined services to work on your plant modernization programs. One call to the Westinghouse Distributor in your area does it.

Teams of Westinghouse Engineering and Product Specialists from the headquarters organization are available through your Westinghouse Distributor. Their mission: To help you analyze modernization problems . . . and select, coordinate and apply equipment. DP-5001-H

YOU CAN BE **SURE**...IF IT'S
Westinghouse

Motor Shops



A-6 COUPLING is easily removed from 20-hp motor shaft by Clarence Phillips, motor repair shop owner, who finds . . .

Electric Impact Wrench Is Timesaver

An electric impact wrench has paid for itself many times over in time saved for the Phillips Electric Motor Service, Long Beach, California. It is part of the equipment on a shop-designed-and-constructed portable handy tool rack of A-type frame construction 50 inches high and 24 inches long, with two flat surfaces on which the various tools are mounted for easy access. The wrench is normally used for removing the coupling from a motor shaft, but also finds many other similar applications in the spacious and busy Phillips shop.

Other tools mounted on the portable tool rack (shown behind wrench in illustration above) include a complete set of accessories for the wrench, a flexible shaft grinder and accessories, an electric drill and accessories, a pneumatic hammer, chisels, gear puller, taps and dies, etc. A long electric cord on a take-up reel attached to the rack supplies electric power to the rack tools by plugging the cord into the nearest wall outlet. The portable rack can then be rolled to any of a number of work stands and benches, where it is handy for the repairman where the work is being done. Thus a motor can be dismantled at a single work bench with a minimum of lost time, and the various parts can then be routed to the area or department required for necessary repairs and refinishing. In reassembling, the same handy tool rack provides the necessary tools at the work bench, where the parts are returned after they have been repaired.

Check List Speeds Motor Checking-In

It is easier and faster to make a checkmark than to write a word or phrase. That is the philosophy adopted by the Empire Electrical Company of Boston, Mass., and applied in their receiving department to facilitate the procedure of checking-in a motor. Therefore, except for writing the customer's name, address, etc., the condition of a motor and the estimated repairs can be indicated with checks.

These checks indicate whether a motor is due for a general overhaul, renewal of bearings, undercutting of the commutator, turning of end bells, winding of armature or what have you. When the work is actually performed, the shop electrician fills in the remaining spaces, indicating the quantity of material or parts used.

With the estimated trouble checked, the parts required indicated plainly, and (on the back of the same card) the hours of labor and test data recorded, billing is fast and sure and the status and history of each motor is recorded for rapid reference. Each job-card carries a separate number and cards are filed numerically.

In case these numbers are forgotten by a customer who wishes to know the status of his job, the number can be quickly ascertained by consulting a Master Book containing the customer's name, the original purchase order number, the Empire job-card number, a brief description of the motor and the dates the motor was received, finished and delivered.

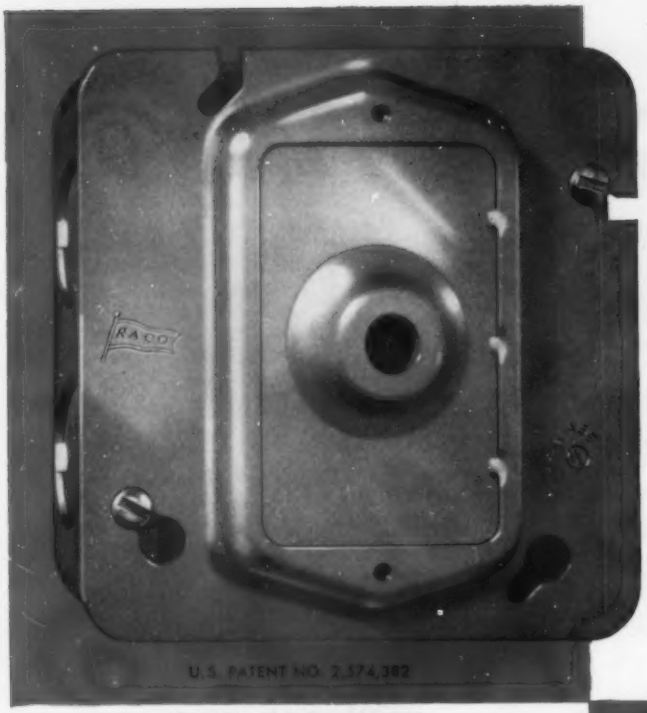
Cleaning Tank Distills Own Solvent

A shop-made, motorized cleaning tank at the Somerset Electrical Co. Inc., Philadelphia, not only offers large capacity for motor cleaning operations but also distills the solvent it uses. By filtering the solvent for reuse, this tank affords substantial savings in the cost of cleaning fluid.

Outside dimensions of this unit are 38 inches by 34 inches by 40 inches high. It is constructed of $\frac{1}{8}$-in. sheet steel with angle iron framing. The cleaning-tray part of the tank is at the top and is 32 inches by 36 inches in area, by 6 inches deep. A removable panel which forms half of the bottom of the cleaning tray is perforated to allow cleaning solvent to drip through to a holding tank that catches the solvent below.

The holding tank has perforations near the top of its side. When dirty solvent collects in the holding tank, the dirt settles to the bottom, leaving fairly clean solvent at the top. When the level of solvent in the holding tank rises to the holes in the side, the sol-

MOUNTED PUMP on side of assembly pumps clean solvent from filtering tank at bottom up to the cleaning tray for reuse.



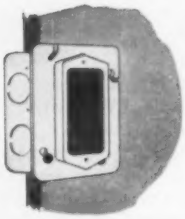
NEW RACO LOCATOR COVER

MAKES IT EASY TO FIND OUTLET BOXES IN NEWLY PLASTERED WALLS

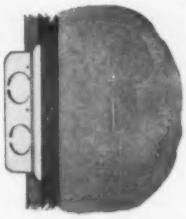
COMPARE THE COSTS PER OPENING!

No. 788—½" Raised • No. 789—¾" Raised

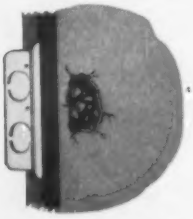
THE OLD WAY
cost—dollars



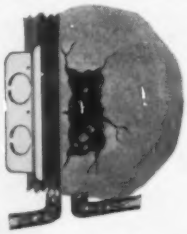
Box and device ring installed ready for the plasterers. Opening is unprotected. Location is unmarked.



Plastering completed. Some boxes may be completely covered by plaster.



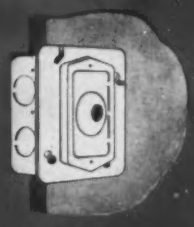
Box located by tapping or painting wall with water. Plaster fragments fill box and conduit. Plaster cracks.



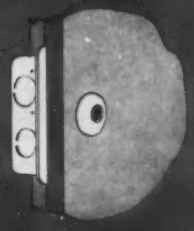
Both box and conduit must be cleaned. This is time consuming and costly. Plaster requires patching.

WRITE TODAY!

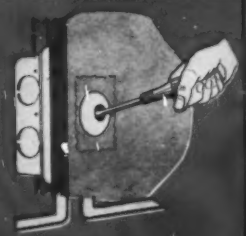
THE NEW RACO WAY
cost—pennies



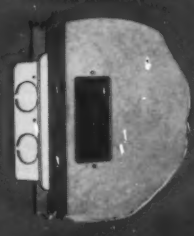
Box and device ring with Raco Locator KO are installed. Opening is protected and location is marked.



Plastering completed. Box hidden by plaster. Locator is easily found.



A screwdriver in Raco Locator KO is bent back and forth. Excess plaster breaks cleanly. Box is free of debris.



Plaster edges are clean and sharp. Wiring and device installation can be done at once. No plaster problems.

Get complete information on RACO Locator Covers

RACO

ALL-STEEL EQUIPMENT INC. AURORA, ILLINOIS

You can always depend on RACO

TANK ASSEMBLY consists of cleaning tray at top with a perforated panel (shown out) as half of its bottom. Solvent runs through perforations to holding tank below, for first step in solvent-renewal process.

vent spills over into another tank below the holding tank.

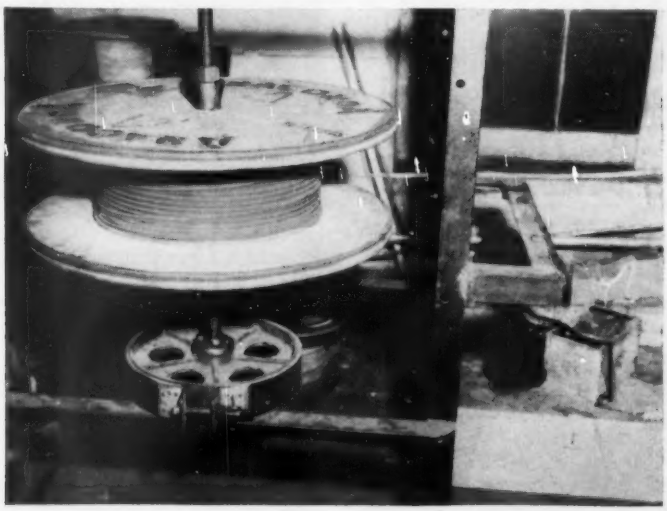
This second tank is filled with waste which further purifies the solvent by filtering out impurities as the solvent passes through. The cleaned solvent goes to the bottom of this tank, from which point it is pumped through pipe back up to the cleaning tray for another cycle.

Tension Rig Improves Winding

A special rig for providing tension on wire during winding operations has been built by the Mississippi Valley Electric Co., New Orleans, La. This rig was developed to eliminate some difficulty encountered in using tension devices on glass insulated wires. When glass insulated conductors were used with the shop's regular tension block, the glass insulation grooved and cut the brass shoes in the tension blocks, and the pressure of the block caused cracking and tearing of the insulation. And because particles of glass became imbedded in the brass shoes, the block caused winding difficulty when used with cotton-insulated conductors.

As shown in the photo, the rig consists of a vertical rod through a brake drum near its lower end which is supported by a bearing. The bearing bracket is mounted on a horizontal frame member which is obscured by the brake drum in the photo. The brake drum is secured to the rod, which is free to rotate. A brake shoe, which can be adjusted by a takeup bolt for varying degrees of braking, is mounted around the drum and fixed to the horizontal framing member.

To use the assembly, a reel of wire is placed on the vertical rod, supported by a stop on the rod about ten inches above the brake. A wedge cone is slipped onto the rod and down to take up play between the rod and the hole through the reel. A nut is then run down the rod to hold the wedge cone and securely tighten the reel to the rod. For winding, the wire is run from the reel to the winding machine, and proper tension is obtained by adjusting the braking action on rotation of the reel.



WIRE TENSION is provided by brake drum and shoe which can be adjusted for any degree of braking of rotation of the wire reel feeding the winding machine.

Customers Receive Visual Education

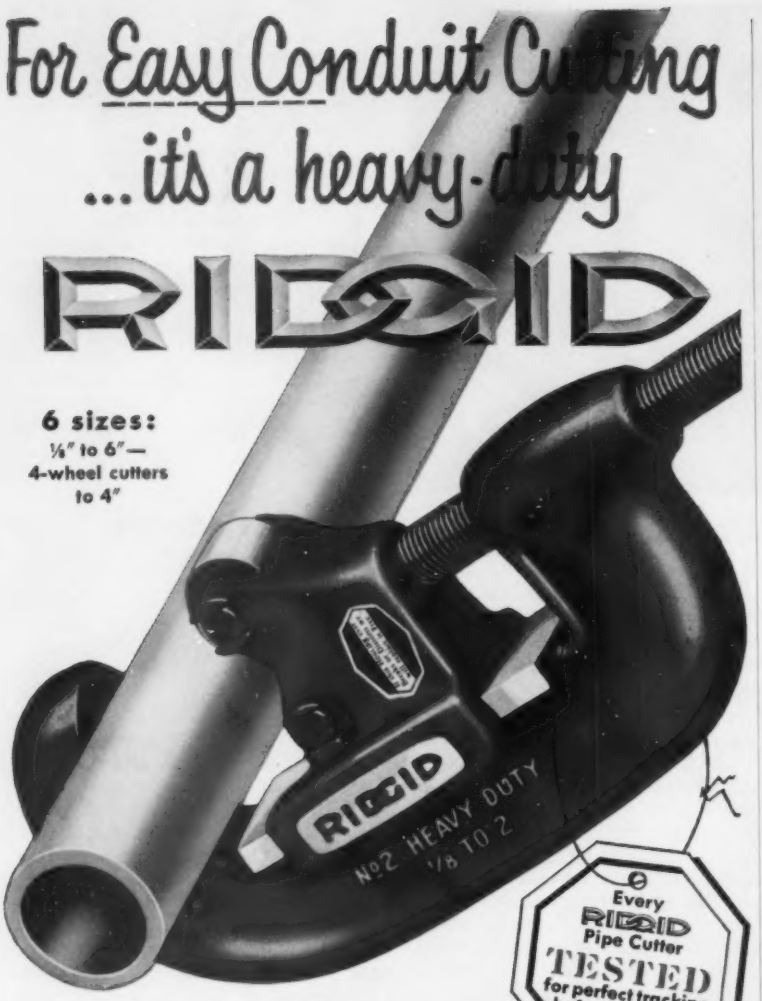
Walter Leirer, owner of Queens Electric Motors, New York, has discovered from long experience that his customers have a healthy curiosity concerning the construction, characteristics and operation of the motors they use in their varying lines of business. This is repeatedly indicated by the number of questions they ask when they bring a damaged motor or motorized device in to the shop for repair. Walt has found that answering the questions fully is good business, for customers are less likely to abuse a motor or neglect its maintenance if they know its limitations, its design, its purpose and its true capacities. Employees of Queens Electric also have found that questions are usually asked through sincere desire to learn and, when this desire is taken seriously and courteously, the casual customer becomes a steady client.

Capitalizing on this natural human quality, Leirer's shop goes far more than half way to meet a customer's quest for information. For example, interesting displays are set up in the customer receiving section, showing various types of motors and equipment, and their internal composition of parts. Test dynamometers and other interesting items of shop equipment are located near the receiving counter where their operation may be observed, while signs tell the customer what it is and, why it is used. In fact, the final checking of torque and overload capacity is performed in the presence of the customer, so that he can see the performance of his own motor under starting and full load conditions.

Customers are also invited to step behind the counter, watch typical shop procedures and observe the general efficiency of Queens men in action.

For Easy Conduit Cutting
...it's a heavy-duty
RIDGID

6 sizes:
⅛" to 6"—
4-wheel cutters
to 4"



Every RIDGID Pipe Cutter TESTED for perfect tracking before shipment

You cut more conduit with less work with a RIDGID

Once you've put a RIDGID Cutter on a piece of conduit and seen how easily and cleanly it rolls through the metal, you won't want any other kind. Smartly balanced for easy action. Tracks perfectly—and special malleable housing, guaranteed warp-proof, keeps it that way. High alloy thin-blade or heavy-duty cutter wheels, practically no burr. For fast cutting with least effort, ask your Supply House for a RIDGID.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

SIGNS anticipate customer questions, tell shop visitors the what and why of each piece of apparatus. Lobby displays also are used for visual education.

Since methods used in this shop are progressive, since equipment is modern, since component replacement parts and materials are the best, since testing procedures are frequent and exacting, and since records are data-packed and up-to-date, every operation in the shop promotes confidence and assures the customer that his repairs are being performed with a high quality of workmanship and materials at a fair price.

Procedures for Installing Ball Thrust Bearings

Bearing assembly, disassembly and examination is not difficult—provided a few basic rules are followed religiously. For example, in assembling it should be remembered that ball thrust bearings of the open type may be slip fit on the shaft or in the housing, and the bearing should be started square and straight to prevent jamming which would be a distinct possibility if the bearing is cocked. Ball thrust bearings of the open type may also have one race tight on the shaft, or in the housing, or in both of these locations.

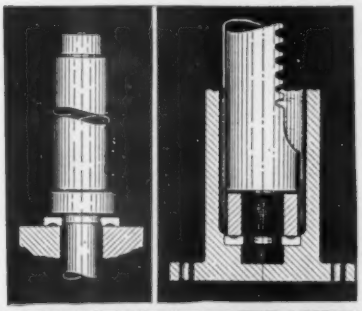
For proper installation, individual races should be pressed into place separately, adding the ball separator only when the assembly is completed. Use of a hammer or pressure through the complete bearing is, of course, to be avoided, since nicking of the ball path would undoubtedly result from this procedure.

Where races are inseparable and are tight, either on the shaft or in the housing, banded ball thrust bearings should have one race slowly rotated while being pressed into position.

In making these recommendations, the Anti-Friction Bearing Distributors Association also stresses the fact that slip fit ball thrust bearings are designed so as to be removable by hand pressure,

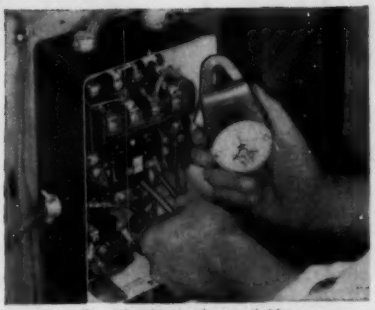
using tools recommended by the bearing manufacturers.

When inspecting such a bearing for roughness, the bearing should be placed flat, face down, on a clean table, then rotated slowly. If roughness is detected during the rotation process, or if the bearing has a tendency to stick at certain points, an inspection for the cause should be then made in greater detail—rejecting the ball thrust bearing if it has (a) broken or cracked rings, (b) dented shields or seals, (c) cracked or broken separators, (d) broken or cracked balls or rollers, or (e) flacked areas on the balls, rollers or raceways. Discarding the bearing is also recommended if (f) it has been overheated (detected by brownish-blue or blue-black discoloration) or if (g) the raceways have been indented.

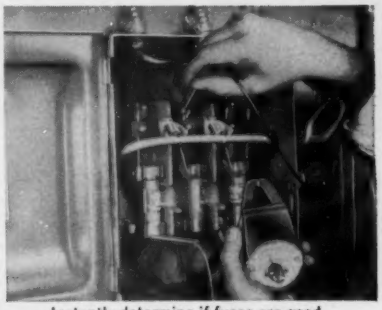


WHEN INSTALLING ball thrust bearings, the end of the tubing and the surface of the race should be cleaned thoroughly, since either dirt or metal chips would interfere with a firm seat. In disassembly, a hammer should never be used to exert added pressure. When checking for roughness, even pressure should be exerted evenly by hand while bearing is slowly rotated on clean table surface.

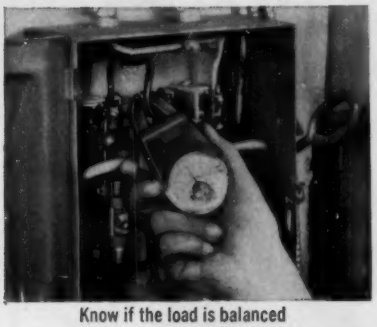
Check appliance current at receptacle



Trouble-shoot relays quickly

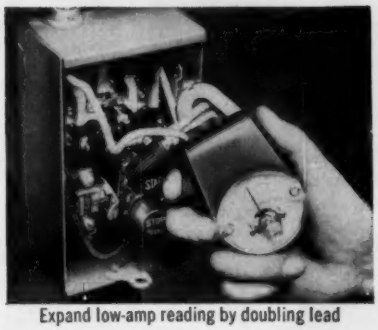


Instantly determine if fuses are good



Know if the load is balanced

Know if windings are grounded



Expand low-amp reading by doubling lead

Eliminate Guesswork!

NOW *EVERY* MAN CAN BE EQUIPPED WITH THIS POCKET VOLT-AMP TESTER

Here is a real improvement for the men on your crew who now use a voltage tester. It's the Amprobe Jr., a pocket tester that measures both voltage and current, with instrument accuracy, without shutting down equipment. And the cost is only $19.85 (just a few dollars more than an ordinary voltage tester), so every electrician and plant maintenance man can carry one.

Pick the Amprobe Jr. that fits the job. 7 models from 0-10 amp to 0-100 amp; choice of either 0-125/250 volts A-C or 0-150/600 volts A-C range. For higher current applications, multi-range Amprobes available for 300, 600 or 1200 amperes. See the full line of Amprobe snap-around volt-ammeters at your jobber's today. PYRAMID INSTRUMENT CORP., LYNBROOK, N.Y. *(Export Div.: 458 Broadway, N. Y. 14)*

Amprobe Jr.®
snap-around volt-amp tester $19.85

Send for these free Amprobe service bulletins:

Pyramid Instrument Corp.
Dept. ECM54, Lynbrook, N. Y.

Please send me the Amprobe service bulletins checked below:

- ☐ How to cut costs and land more jobs
- ☐ Trouble-shooting electric motors
- ☐ How to boost service profits
- ☐ Portable test instruments

NAME_____

COMPANY_____

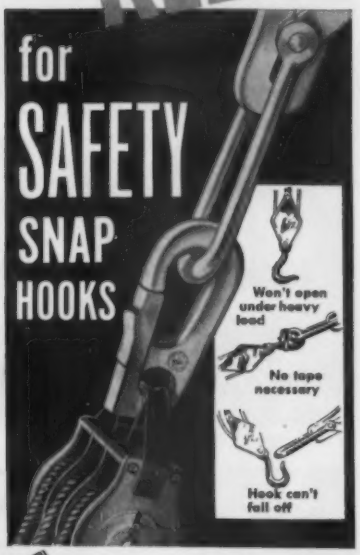
ADDRESS_____

CITY_____ ZONE____ STATE_____

Look to the Leader

KLEIN

for SAFETY SNAP HOOKS



455 Solid Eye

Here's strength, safety on heavy loads—for blocks, tackles and hoists. Klein Safety Snap Hooks are time savers, too, eliminating the necessity of taping or wiring the throat. Made of drop forged steel—carry a working load of 8,000 pounds with adequate safety factor. Snap on easily with one hand—may be used on any conventional steel block 6 inches or smaller, or on chain hoists or snatch blocks. Four types regularly available. Specify 455-SH-3 Snap for use with 1½-ton hoists . . . No. 455-SP for double chain hoists and for attachment at housing. Klein can also supply safety snap hooks for lighter loads.

455-S Swivel Eye

455-SH Swivel Eye

Foreign Distributor: International Standard Electric Corp., New York

455-SP

Write for your free copy of the Klein Pocket Tool Guide today!

ASK YOUR SUPPLIER

Mathias KLEIN & Sons
Established 1857
3200 BELMONT AVE CHICAGO 18, ILL

L-V SWITCHING SOLVES CONTROL PROBLEM

[FROM PAGE 105]

normally available, but these do not simplify the wiring. Also, this type of master control is not particularly simple or convenient when the numbe. of units controlled is large.

The ideal master control would be a single pushbutton station in the basement to control all the units in the building, with a minimum number of wires extended to this master control.

One way of accomplishing this ideal is shown in the Schematic Control Diagram, Fig. 2. Each local pushbutton is equipped with a normally closed contact to maintain the master control circuit available at all times. An additional relay is provided at the master station to operate a pilot light, which serves as a reminder of the button last pressed. If the light is ON it indicates that the "on" button was pressed last.

The wiring diagram for a typical air conditioning unit and the master control station is shown in the Typical Wiring Diagram, Fig. 3.

In order to improve reliability and to keep the size of various components within practical limits, the ideal of a single master pushbutton station is modified in the actual installation and a compromise is effected by using six master control units in the basement. Each master control unit controls the air conditioning units on one floor only (there are no air conditioning units on the first and eighth floors). The complete wiring hookup is shown in the One-Line Control Riser Diagram, Fig. 4. There are six control risers, each with four wires. Voltage drop considerations require that these conductors be No. 10, which are run in ¾-inch conduit. To further reduce voltage drop in the control circuit, the control wires for each floor are No. 12 conductors connected in a closed loop. It may be noted that there is no voltage drop problem in the power circuits to the motors since these are connected independently to the nearest available supply.

A 500-volt-ampere transformer per floor is required to operate all the units on one floor simultaneously. This changes the system from Class 2 to Class 1, without self-energy limiting properties. But this offers no serious problem, since the wiring is all in conduit, and overcurrent protection is easily applied to the small number of conductors involved.

The method of connecting an individual control station is shown in Fig. 1. High voltage wiring is confined within the 4-inch outlet box, located within the larger control box. This complies with the Code, even if the leads to the relay are not insulated for the full voltage of the power circuits.

In cases where a continuing experiment, in one of the laboratories or offices, requires that a particular air conditioning unit continue to run independent of the master control, all that is necessary to keep the unit in operation is to disconnect the master circuit at the terminal strip of the particular unit involved.

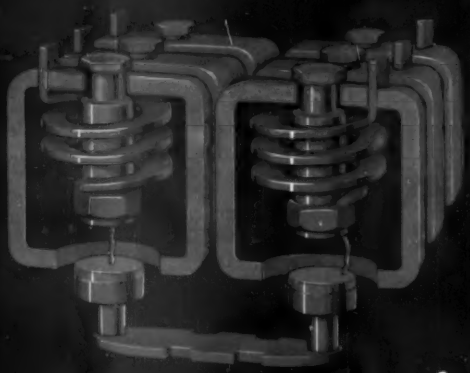
This system is expected to give the building engineer the necessary control required for full supervision, and to save him many hours of labor per year with a minimum of disturbance to the individual room occupants. Maintenance is expected to be low because of the standard low cost parts used throughout.

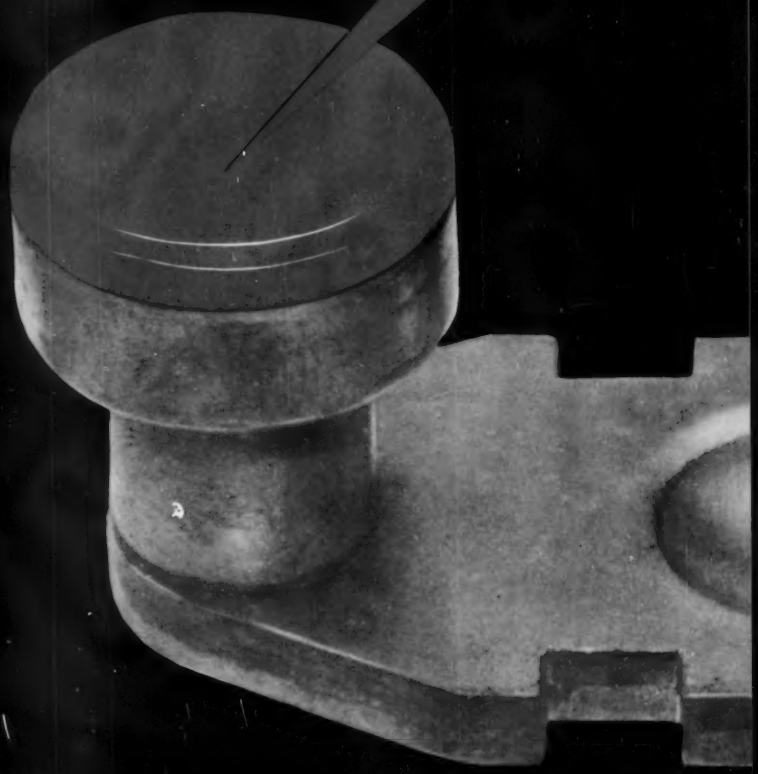
The remote control relays and pushbuttons are standard General Electric equipment, and were installed by Ling Electric Company, electrical contractors for the entire new building addition. Louis N. Goodman and Associates were the electrical engineers, and associated architects were Audry and Feitel, Smith and Padget, August Perez and Associates, all of New Orleans.

MARKING 50TH ANNIVERSARY of The Beltzhoover Electric Company, Cincinnati, these officials carry on in the tradition of the late Charles M. Beltzhoover who founded the company and perished in the 1949 Noronic ship fire in Toronto. Quality electrical installations is the by-word of Vice President Joseph A. Pope, who has been with the firm 24 years, and President John D. Beltzhoover (right) who is chalking up his 44th year with the company. Both executives share repsonsibility for the company's construction activities; count among their customers some of the city's largest industrial and commercial firms.

CONTROLLED LIGHTNING

CLARK Type "CY" AC MAGNETIC STARTERS effectively control the millions of miniature lightning flashes (arcs), which bombard the contact tips—to prevent burning, pitting or build-up at any one point. This is accomplished by the use of strong multi-turn magnetic blow-outs and double-break contacts. Forced rotation causes the arc to move continually over contact surfaces to distribute the heat. Moreover, the magnetic field tends to quench the arc by either lengthening or confining it. Result: contact tips never require filing, dressing or cleaning and you get more dependable performance and longer contact life with less maintenance.





CLARK Type "CY" Starters offer many other advantages. Steel arc chambers are non-carbonizing—The solid top construction limits ionized gases between wiring terminals. Cabinets are designed to provide ample wiring space for easy installation. No tools are required to inspect contacts. All contacts as well as other components which may require service are quickly and easily accessible for inspection, removal and replacement.

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

See reverse side for range of sizes, enclosures and combinations.

the CLARK type "CY" AC MOTOR STARTERS

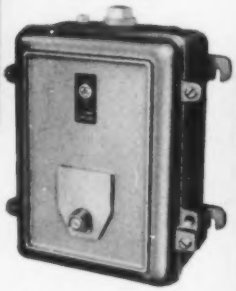
available in sizes, combinations and enclosures

TO MEET YOUR REQUIREMENTS

SIZES: 0, 1, 2 and 3. Sizes 2 and 3 employ the new "CY" arc interrupting principle

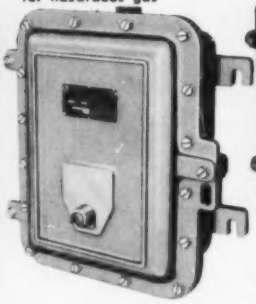
BASIC Across-The-Line STARTER

NEMA Type 1
General Purpose

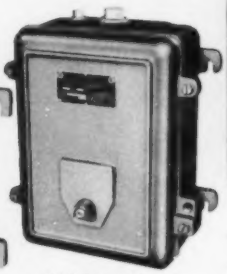


NEMA Type 4
Water-tight

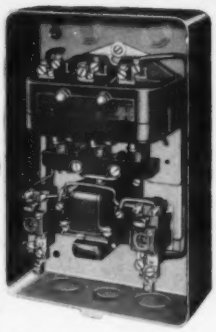
NEMA Type 5
Dust-tight



NEMA Type 7
Explosion Resisting
for hazardous gas



NEMA Type 9
Explosion Resisting
for hazardous dust



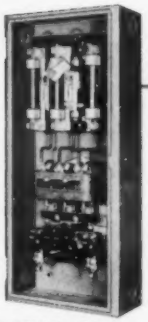
Open view — showing accessibility and generous wiring space

TYPES OF ENCLOSURES

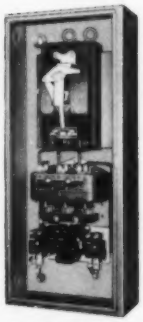
COMBINATION STARTERS

NEMA Type 1
General Purpose

NEMA Type 1A
Semi-Dust-tight



Bulletin 6018 Combination AC Magnetic Starter, with Fusible Disconnect Switch.



Bulletin 6020 Combination AC Magnetic Starter with Air Circuit Breaker.

A WIDE VARIETY OF MODELS are available for every application within their horsepower limits.

TYPES OF ENCLOSURES

NEMA Type 4
Water-tight

NEMA Type 5
Dust-tight

NEMA Type 7 for hazardous gas

NEMA Type 9 for hazardous dust

NEMA Type 12 Industrial Type

THE CLARK CONTROLLER COMPANY
1146 EAST 152nd STREET • CLEVELAND 10, OHIO

Please send me 8-page descriptive literature on Clark Type "CY" Starters.

NAME .....

COMPANY .....

TYPE OF BUSINESS .....

ADDRESS .....

CITY AND STATE .....

Use this coupon for obtaining complete information on CLARK Type "CY" AC Motor Starters with the revolutionary new arc interrupting principle.

Practical Methods

Hand Trucks Cut Material Handling Costs

CONSTRUCTION

Time-saving methods of handling equipment and materials are becoming increasingly important on electrical construction projects. Contractors are beginning to realize that this is one category in which job labor costs can be shaved. Many have already adapted mobile techniques for moving material from point of storage to installation areas at the job site. Others are following suit. Those who have invested in material handling equipment know that it pays off handsomely. Those who hesitate to make the investment need only acknowledge that a mechanic pushing a hand truck can move more material farther in less time and with less fatigue than two or more men could when "lugging" it by hand.

Harlan Electric Company, Detroit, is one of those progressive contractors who long ago began operating on this premise. As a result, some form of material handling equipment is found on all Harlan jobs. The new City-County Building project in Detroit is no exception. Here, Harlan mechanics can be seen pushing hand platform trucks loaded with conduit, conduit elbows, panels, bus duct sections, power tools and similar heavy items. And there are enough trucks on the job so that no one crew has to wait in turn. On multi-story buildings, the loaded trucks are pushed to the construction platform hoist, lifted to the designated floor and rolled right up to the installation crew.

By taking the drudgery out of heavy electrical construction work, Harlan assures efficient operations through better workmanship, better performance and better temperament.

READY TO ROLL from storage area to riser location are three lengths of 800-ampere bus duct on four-wheel platform truck. Second truck loaded in background will be next. Consider the number of mechanics required to "carry" just one length of this duct.

Cast Sleeves Support Multiple Conduit Risers

INSTALLATION

Groups of pre-assembled pipe sleeves serve a dual purpose in the construction of Detroit's new City-County Building. When accurately positioned and cast into the concrete floors of the twin units (one 20 floors high, the other 14 floors), they provide a freeway for numerous telephone conduit risers serving the buildings. Once the conduits are installed, the sleeves double as handy bases to which conduit support brackets can be welded.

This time-saving method is used by Harlan Electric Company, Detroit, project electrical contractor. Instead of using the familiar sheet metal sleeves, Harlan field engineers chose heavy 4-inch pipe, cut to required lengths and mounted side-by-side in multiples as required by the riser design. Multiple sleeves are held rigidly in position by two lengths of conventional ½-inch steel reinforcing rod—one length welded to each side of each sleeve. Groups of assembled sleeves are prefabricated in the field shop at the job site and distributed to installation points on the deck before the pour is made.

MULTIPLE SLEEVE ASSEMBLY cast in concrete floor provides openings for telephone riser conduits. Pre-fabricated groups of sleeves are easy to install; double as firm base to which conduit support brackets are welded.

Conduit riser supports consist of two 1-inch wide sections of 2½-inch angle iron. One flange of each angle is welded to opposite sides of the conduit. The other flange is welded securely to the top of the pipe sleeve through which the riser passes.

LOCATE GROUNDS
quickly
with the BRUNT
FAULTFINDER

Find grounds in energized power circuits—FAST. The Brunt Faultfinder —$450, express prepaid—makes it a one-man job. Country's largest manufacturers use it to prevent costly work stoppages.

FAULTFINDER FEATURES

- Can be used in dark or noisy locations.
- Locates faults on ungrounded wiring systems up to 550 volts, a.c. or d.c.
- Imposes only 2 amperes on circuit.
- Traces pole line signals without climbing.
- Combination ground detector and fault locator.
- Equally strong signal on open or enclosed wiring.
- No delicate meters or instruments to adjust.
- Small, compact, durable, easy to operate.
- Phase indicator lights visible at a distance.

ORDER TODAY AS PREVENTIVE MAINTENANCE AGAINST SHUTDOWNS OR SEND FOR BOOKLET.

PARR MANUFACTURING CORP.
48 Austin St.
Newark 5, N. J.

Please send me your booklet "THE BRUNT FAULTFINDER."

NAME.....
TITLE.....
COMPANY.....
STREET.....
CITY.....ZONE....STATE.....

Jeep Proves To Be Versatile Workhorse

INSTALLATION

The jeep, which proved to be such a rugged all-purpose vehicle during World War II, is proving equally versatile on large construction projects. Small in size, with a small wheel base and an oversized power plant, the jeep can be maneuvered into tight spots, can turn on a proverbial dime, can carry several times its own weight in equipment or material and, when used in conjunction with pulleys and cables, can be used as a mobile winch or jack.

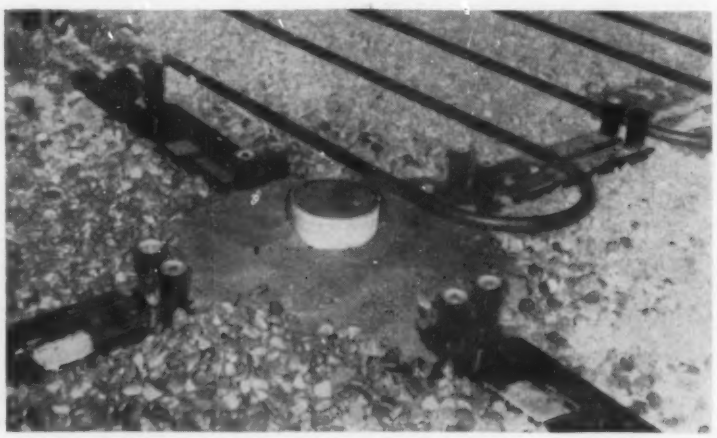
All these attributes are known to electrical contractor H. B. Durkee of Cleveland, Ohio, and the jeep is used extensively on Durkee projects for fast conveyance within a plant under construction, permitting a foreman to supervise several widely-separated operations, delivering key materials or tools from a central crib or storage area to local work points, or pinch-hitting as a lifting means when equipment is being set in place.

While working in the Cadillac Tank plant, Durkee used the jeep extensively for raising distribution, control and transformer equipment to the truss level for installation, first securing a sheave at the foot and base of a structural column, then running a steel cable from the jeep frame, through the lower and upper pulleys, and down to the load to be lifted. Then, with the jeep in low gear, the equipment was handled quickly with minimum effort.

Special Duct Collars For Radiant Heated Floors

INSTALLATION

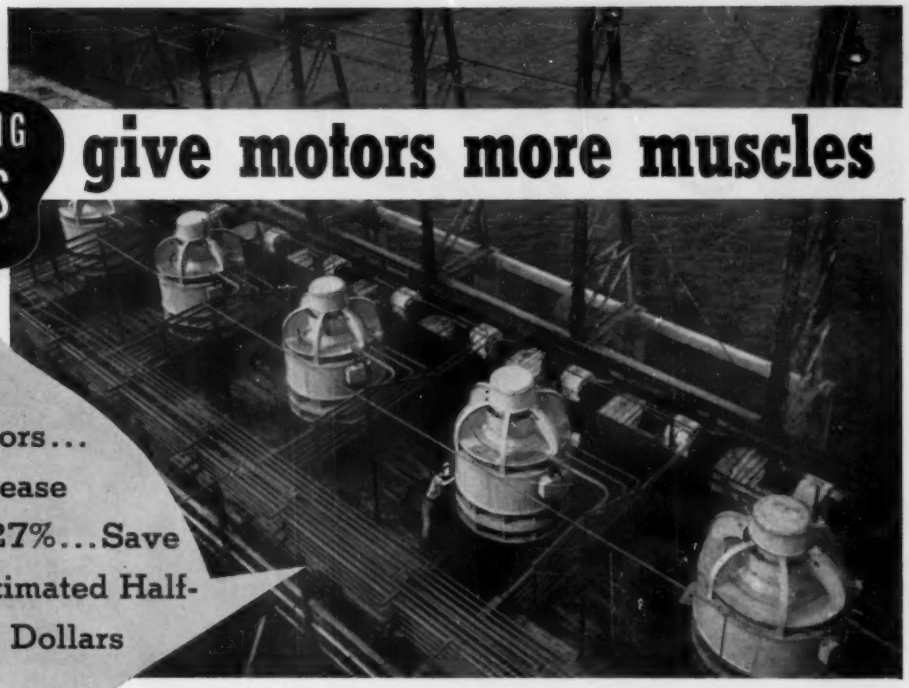
When radiant heating lines were installed for auto accessory distributor W. S. Moore of York, Pa., the installation introduced a problem for electrical contractor John Z. Barton who had the assignment for a 2-cell underfloor duct system. The problem pertained to duct-coil arrangement, for the desired elevation of the heating runs would



DEEP INSERTS on 2-foot centers and extra-depth collars on underfloor duct junction boxes made it possible for standard and low-potential wiring channels to be placed sufficiently low in the slab to permit the incorporation of radiant heating coils in this concrete floor.

DOW CORNING
SILICONES

give motors more muscles



Uprate pump motors... increase capacity 27%...Save an Estimated Half-Million Dollars

Much of the sea water pumped into The Dow Chemical Company's famous "magnesium from the sea" plant in Freeport, Texas, is handled by six 71,000 gpm centrifugal pumps. Each pump is direct-driven by a 300 hp, 277 rpm motor. The entire line of motors is mounted on a massive underwater concrete foundation.

Recently Dow's plant expansion program reached the point where a pumping capacity of 90,000 gpm per unit was required. That capacity could be reached by 450 hp motors operating at a higher speed. But conventional motors rated at 450 hp would be almost half again as large, and much heavier than the existing units. Extensive changes in mounts, brackets and other fittings, as well as reinforcement of the underwater foundations would be required. Estimates of the cost of reinforcing the foundations alone ran as high as a half-million dollars. And that's not counting the cost of the new motors or the fact that the work would have to be done all at once, shutting off the intake canal and all but halting plant production.

Dow engineers solved the whole problem at minimum cost by having the motors rewound, one at a time, with silicone (Class H) insulation to develop 450 hp at 327 rpm. Capacity of each pump was increased to 90,000 gpm without any further modification of the installation.

An extra advantage of Class H insulation was demonstrated when one of the motors was removed to correct a shaft rub that had developed at the upper seal. This same motor had also developed a small leak in its upper housing. When the motor was disassembled, the bottom ends of the coils were found to be immersed in 25 gallons of rain water. And still the silicone insulated coils remained in good operating condition.

That's the kind of performance that has convinced management, maintenance and design men that they get maximum life and reliability at minimum cost when they specify Class H insulation made with Dow Corning silicones for hard-working motors, transformers and other electrical equipment.

mail this coupon today!

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

Dow Corning Corporation, Dept. G-17, Midland, Michigan

Please send me

- ☐ More performance data on Class H
- ☐ List of Class H rewind shops
- ☐ List of Class H Motor and ☐ Class H Transformer Manufacturers
- ☐ "Tall Tales and Fabulous Facts" about silicone products

Name_____ Title_____

Company_____

Address_____

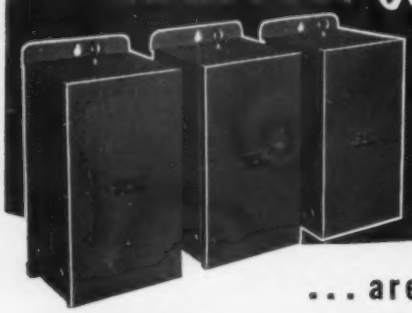
City_____ Zone_____ State_____

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D.C. (SILVER SPRING, MD.)

Canada: Dow Corning Silicones Ltd., Toronto • Great Britain: Midland Silicones Ltd., London • France: Cie. St. Gobain, Paris

WHERE SAFETY AND DEPENDABILITY COUNTS...

MARCUS dry type TRANSFORMERS



3 of the 19 Marcus transformers installed, with ratings up to 150 KVA.

... are STAR PERFORMERS at the Cincinnati Garden!

Feeding the power where and when needed at Cincinnati's huge and busy "Garden" is another important assignment for MARCUS Dry Type Transformers.

Because all Marcus Dry Type Transformers are now being constructed with Hi-Heat, Hi-Dielectric Magnet Wire, insulation levels of at least 10 times present industry standards are easily attained.

This factor alone, plus an enviable record of trouble-free performance and matchless dependability made Marcus Dry Type Transformers the choice of the Beltzhoover Electric Co., of Cincinnati, Electrical Contractors for the project, and A. M. Kinney, Inc. the consulting Engineer on the job.

Increase your power Performance Standards with Marcus Dry Type Transformers.

Capacities from 1 to 3000 KVA
- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

MTC "Mark of Quality"

Representatives in Principal Cities

MARCUS TRANSFORMER CO., INC.
HILLSIDE 5, NEW JERSEY

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

interfere with the ducts, if standard floor outlet collars had been used. Extra-depth collars were therefore ordered and were made specially by Nepco so that ducts could be set at a lower level and radiant coils installed above them, as indicated in the accompanying illustration. Junction boxes were similarly specified, with extra-depth collars, and the entire duct system was leveled, grouted and surrounded by a crushed stone base before heating coils were placed in position and the concrete flooring was poured.

This simple solution made it possible to incorporate the advantages of a multi-duct system and closely-spaced floor outlets for lighting, power and telephone service, plus the uniform warmth of a floor heating installation.

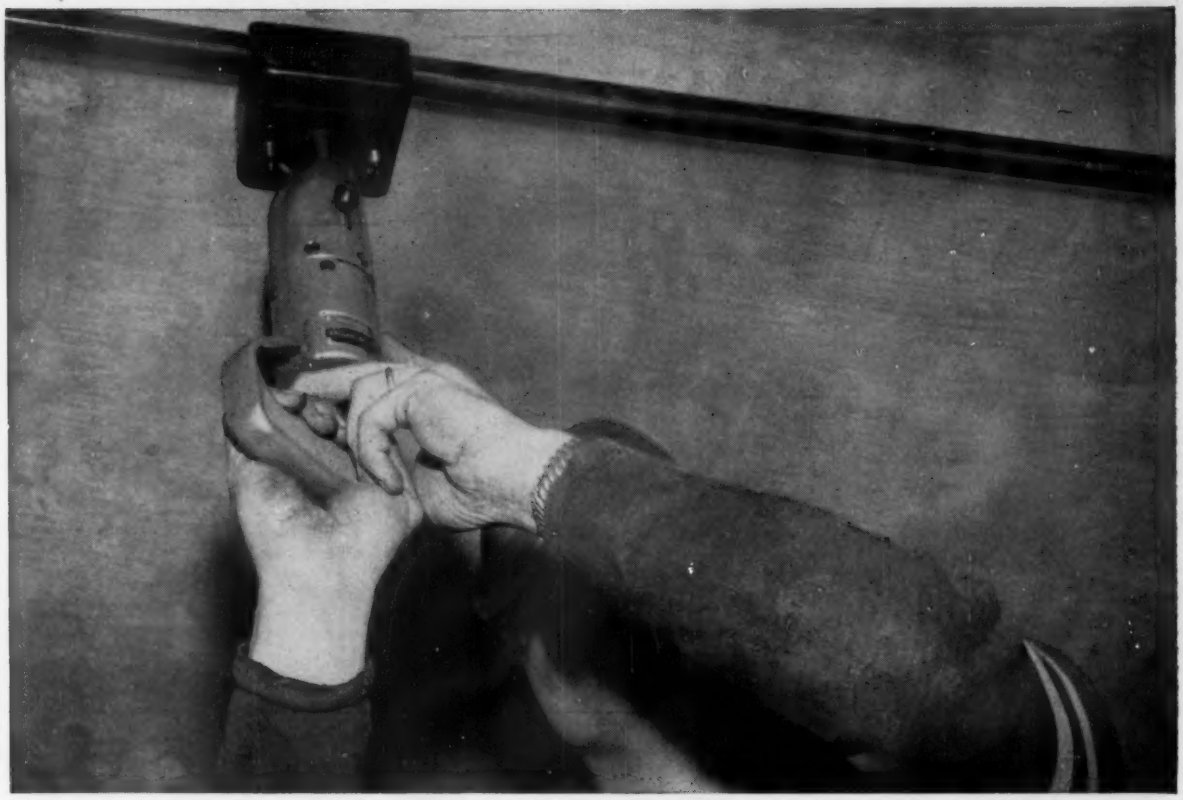
Mobile Bin Lockers Supply Wiring Crews

CONSTRUCTION

Mobility is a characteristic of modern field operations in electrical construction work. The present trend toward long, one-story industrial plants and large-area commercial buildings precludes sole reliance on central material and tool storage areas as in the past. Competent job supervisors strive to keep non-productive labor at a minimum—and that means reducing the amount of walking to and from stockrooms and tool chests. Effective methods of material and tool dispersal must be added to bring the source of supply closer to the installation crews.

To gain top efficiency in field operations, Harlan Electric Company of De-

LARGE PARTS LOCKER has total of 96 steel bins (accessible from both sides) each measuring 12 in. by 10 in. by 8 in. Unit is on casters and has two lifting hooks to permit hoisting by crane if necessary.



Save Up to 80% on Fastening Costs with the REMINGTON STUD DRIVER

"Cuts my conduit anchoring cost by an average of 74%"—writes one electrician about his Remington Stud Driver, and it's a typical report. With a speed of up to 5 studs per minute, this powder-actuated tool is bringing new economy to the job . . . new opportunities for electrical contractors.

Many contractors say they can bid lower, get more jobs with the Remington Stud Driver. Others tell us that the tool's light weight—6 lbs.—makes overhead work a lot easier. All are agreed that you can't beat the Stud Driver for setting studs in concrete and steel.

What's your fastening job? Whether you're fastening eye bolts for stringing wires or conduit clips to concrete, you'll save money with the Remington Stud Driver. For further information on how this amazing tool can help solve your fastening problems, mail the coupon at right.

"If It's Remington—It's Right!"

Remington DUPONT

Listed & Approved by Underwriters' Laboratories, Inc.

QUESTIONS YOU ARE ASKING

QUESTION:

Where can I get information about the guards that many electrical contractors have been using for special applications?

ANSWER:

Just send the coupon below; we'll be glad to supply you with a description of all the guards and their uses.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. ECM-5
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me *free* copies of the new booklets showing how I can cut my fastening costs.

*Name*_____

*Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

FULLMAN **Latrobe**
Electrical Products

Floor Boxes and Wiring Specialties

ADJUSTABLE WATERTIGHT FLOOR BOXES

NON-ADJUSTABLE WATERTIGHT FLOOR BOXES

ADJUSTABLE GANG FLOOR BOXES 1-2-3 AND 4

NOZZLES AND FLOOR BOX ACCESSORIES

FLOOR JUNCTION BOXES

UTILITY OUTLETS

INSULATOR SUPPORTS

PIPE AND CONDUIT HANGERS

ARMORED CABLE SUPPORTS

CABLE CLIPS

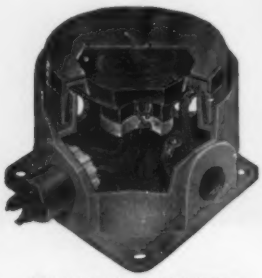
STAPLES

FISH WIRE

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.

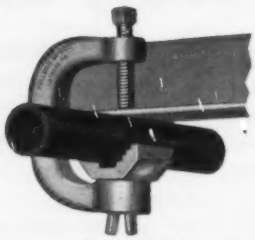
"Latrobe" Products are clean and compactly designed to cut installation time and give smooth, trouble-free service.

"Latrobe" Products give a full measure of value.



ADJUSTABLE—WATERTIGHT FLOOR BOXES

Adjustable Floor Boxes are now bonded which makes them fire-proof—come in single round or square bodies—also furnished in square single gang, two gang, three gang and four gang types.



"BULL DOG" PIPE OR CONDUIT HANGER

This sure grip Bull Dog hanger is economical and dependable. Hangs pipe or conduit ½", ¾", and 1" to steel beams ⅜" thick.

Fullman Manufacturing Co.

1209-1215 JEFFERSON STREET

LATROBE, PA.

COMBINATION UNIT has interior shelf and bin design to accommodate wiring accessories and hand tools. Multiple lockers can be spotted in tandem or opposite each other to form mobile stockroom "aisles" if desired.

troit uses mobility to the fullest extent. Not only are heavy power tools and equipment placed on casters and wheels, but miscellaneous small hand tools and wiring accessories are stored in rolling bin lockers which follow installation progress. In addition to the convenience introduced by having the tools close at hand, the existence of a permanent designated storage space insures their being put away after each use instead of being allowed to lie on the site exposed to the possibility of loss or damage.

Two types are being used by Harlan mechanics on the new City-County Building project in Detroit. Both are of steel construction and have full-length, double-door openings on each side. Doors can be securely locked. The larger unit is 60 in. long, 72 in. high and 29 in. wide and has 8 tiers of six bins on each side (total of 96 in the locker) for such small items as outlet boxes, covers, locknuts and bushings, conduit couplings, nuts and bolts and similar miscellaneous material. The locker rolls freely on heavy 5-in. industrial casters.

The smaller unit is of similar construction but combines material and tool storage. Interior design provides bins and "cabinets" for wiring accessories and small hand tools, plus a clear base area—accessible from both sides—for hickeys, hand stocks and other larger equipment items.

As work progresses, these lockers are moved along the floor to assure an ample supply of materials and equipment within easy reach of the mechanics. A total of eight are in use on this project.

Packaged Powerstat Dimmers

GIVE A FULL RANGE OF PROFESSIONAL LIGHTING EFFECTS

Packaged Powerstat dimmers are ideal for smaller theatres, summer stock, churches, schools and colleges, community halls, clubs.

Big switchboard dimming...blending...brightening
AT SMALL BUDGET COST

Packaged Powerstat light dimming equipment costs from $425.00 to $1,000.00 depending on the capacity with which you want to start. It is designed so that additional units can be added as requirements and budget increase.

These autotransformer dimmer assemblies provide professional, stepless, flicker-free light intensity control for "spots" or full "banks". Available in capacities to 12,000 watts. Installation is easy. Operation is simple. Unlike resistance type dimmers, Powerstat dimmers operate cool — no dangerous heat, and you only pay for the current being used. Write for full information.

THE SUPERIOR ELECTRIC COMPANY

6054 Demers Ave., Bristol, Conn.

Manufacturers of: Powerstat Variable Transformers • Stabiline Automatic Voltage Regulators • Voltbox A-C Power Supplies • Powerstat Light Dimming Equipment • Varicell D-C Power Supplies • Superior 5-Way Binding Posts

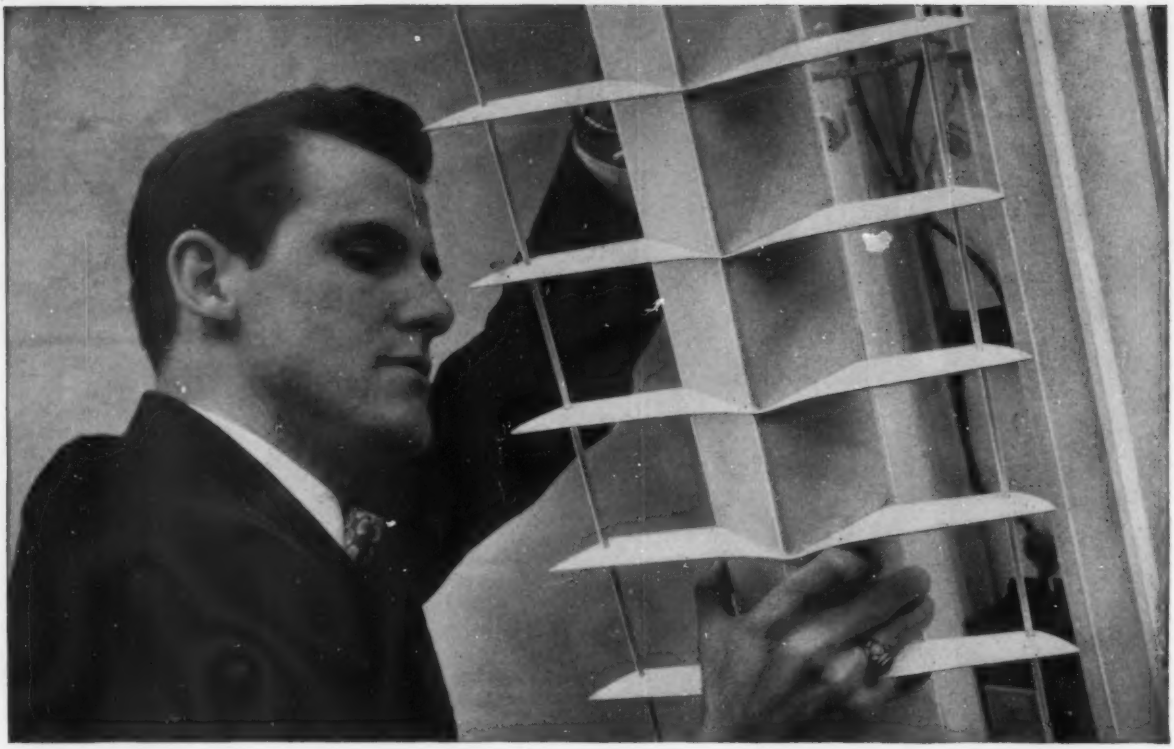
THE SUPERIOR ELECTRIC COMPANY
6054 Demers Ave., Bristol, Connecticut
Please send me Bulletin D651P

Name .....

Company .....

Company Address .....

City ..... *Zone* ..... *State* .....

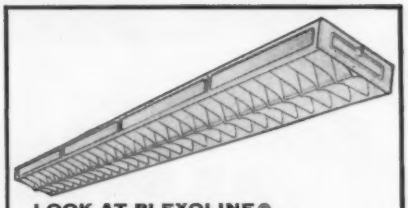


HOW TO BUY FIXTURES TO PROTECT YOUR LIGHTING PROFITS

Don't guess when you buy lighting fixtures. Don't gamble with your profits by relying only on sales stories and catalog pictures.

Before you figure any lighting job, take the time to handle actual fixtures yourself. Compare them. Feel the difference. Look for the contractor features that mean savings in installation time and reduced labor costs for you.

We ask only that you look at Day-Brite's PLEXOLINE or others in the complete Day-Brite line before you make any buying decision. We know Day-Brite gives you more for your money. The important thing is for *you* to prove it for yourself.



LOOK AT PLEXOLINE®...
FEEL THE DIFFERENCE...
BEFORE YOU BUY.

More than just a fixture, PLEXOLINE is a complete lighting system. Many patterns are possible, including circles, acute and obtuse angles. For stores, offices, schools, hospitals. Available in Slimline and Rapid Start Fluorescent. Write today for informative literature.

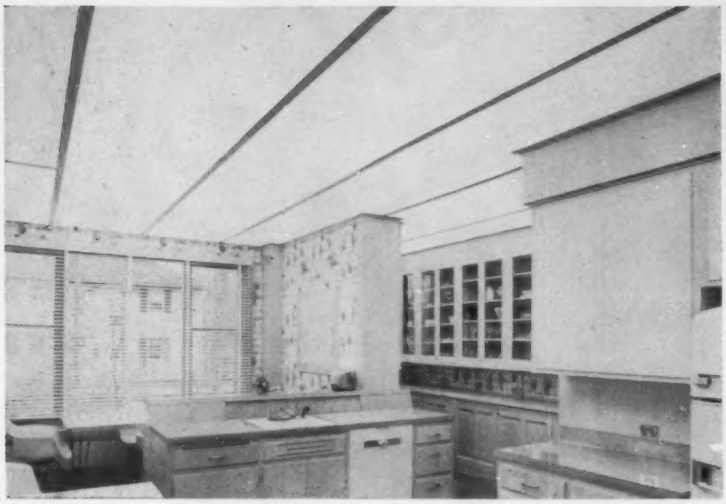
NATIONALLY DISTRIBUTED EXCLUSIVELY THROUGH LEADING ELECTRICAL WHOLESALERS

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc.
5402 Bulwer Ave.,
St. Louis 7, Missouri.
In Canada: Amalgamated Electric Corp., Ltd.,
Toronto 6, Ontario

430

Modern Lighting



Luminous Ceiling Modernizes Old Kitchen

Old homes, with consistently large rooms and high ceilings, provide an excellent opportunity for modern-minded homeowners to use wall-to-wall luminous ceilings as a modernization medium. In fact, in an old home such as that occupied by G. B. Speigel in Highland Park, Illinois, the use of a corrugated plastic ceiling made it unnecessary to install a new plastered ceiling; it lowered the apparent height from an initial 11 feet to a more practical 9-foot level and, due to the room's new proportions and new-found brightness, it definitely added spaciousness and cheerfulness to this important household working center.

To cover the 12-by-24-foot area, a total of 40 cool white rapid start T12 fluorescent lamps were installed, 34 of them being 40-watt and six being F20s. They were installed end-to-end in continuous rows, the rows being 2 feet apart with the single-lamp channels mounted directly on the original ceiling. This results in a 1-to-1 ratio between lamp-to-lamp and ceiling-to-lamp distances, and provides uniform distribution of light over the luminous panels, with no obvious bright or dull areas visible.

For maximum convenience and utility, the lamps are switched in groups—one group being installed above the dining area, a second group mounted above the sink and electric dishwasher island, and so on. When local areas are lighted separately, intensities of from 44 to 47 footcandles are obtained on work or eating surfaces. With all lamps in service, however, intensities are increased to the 55-to-80-fc range.

Another feature of this installation is a color wheel with a general line incandescent lamp mounted between fluorescent rows over the dining table. For late evening snacks, this color wheel can be put into operation, spreading constantly-changing patterns and varieties of light fanwise over the plastic, giving a novel night-club atmosphere for informal gatherings and relaxation. Also located above the plastic ceiling is an orange-colored filament lamp which may be left burning as a low-intensity night light. It is on a separate switch.

As to color: the floor covering is predominantly red, cabinet woodwork is blond, painted wood surfaces are light green and wall paper features a green design on a near-white background.

Editorial note: While the editors of this magazine generally prefer photographs of lighting installations to be taken at night-time when the full effect of the artificial lighting is apparent, in this instance we invite a comparison with the outdoor natural lighting which existed at 5 o'clock on an afternoon early last summer. Although this picture was exposed in accordance with interior light-meter readings, it is observed that details of objects seen through the Venetian blinds are not over-exposed—an indication that the intensity of artificial illumination in this kitchen is roughly comparable to late afternoon spring or fall sunlight.

Department Store Applies Practical Lighting Formula

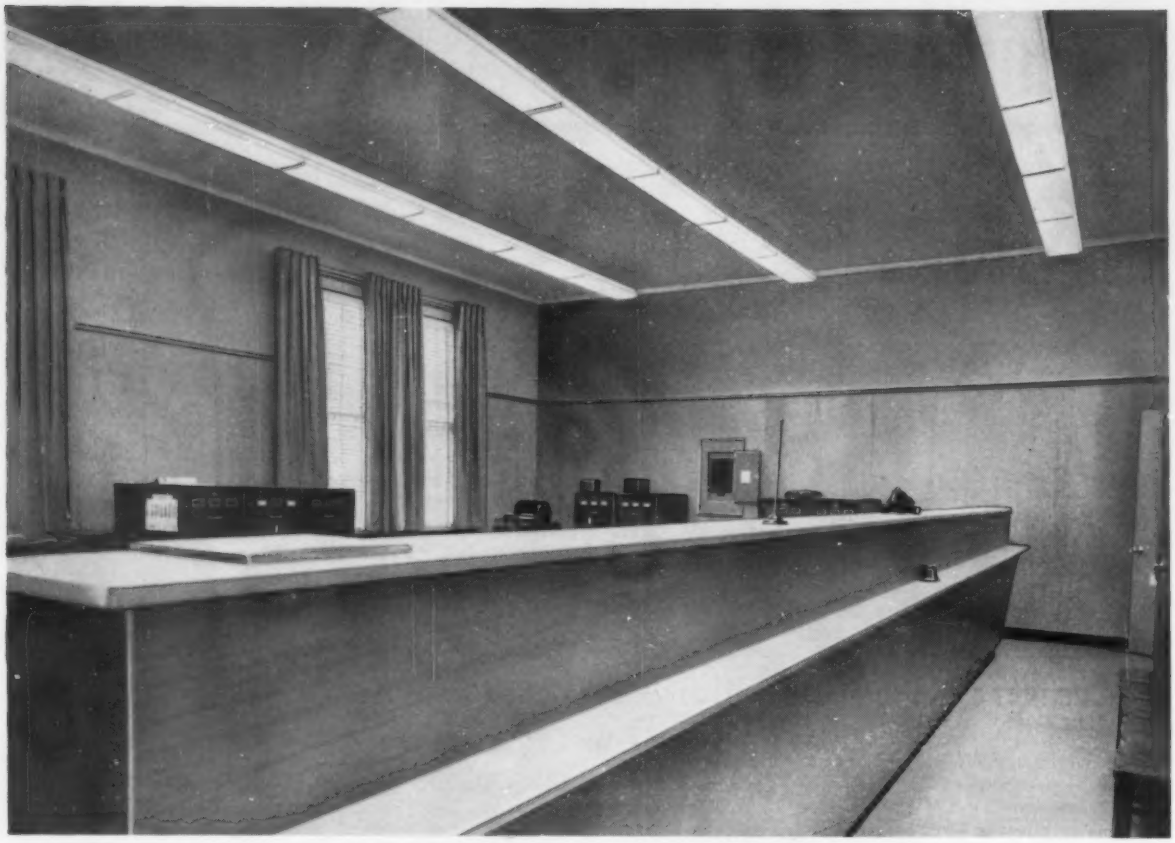
Lighting as modern and practical as the store it appears in can be found in the men's and boys' clothing departments of The Higbee Company, Cleveland, Ohio, where high quality merchandise, illumination, decorative motifs and eye-catching displays go hand in hand.

To illustrate: structural columns have been attractively sheathed in striated plywood, surrounded by asymmetric platforms and girded with false ceilings containing directional spotlight units. Merchandise may be displayed either in platform or column-mounted arrangements, with illumination levels ranging between 150- and 200-footcandles, obtained from nine recessed, swivelling 150-watt incandescent PAR-38 lamps mounted in the overhead canopy.

General illumination in aisles between floor cases is 30 footcandles, provided by 4-lamp 8-foot Day-Brite fixtures, with deluxe warm white fluorescent tubes shielded by Holophane Controlens cover plates. Although these units are surface-mounted, their obtrusion from the ceiling is optically lessened by encasing them in outward-slanting metal frames painted to match the ceiling background.

Coats displayed in wall cases receive 110 footcandles of illumination at shoulder level, the light source being a single continuous row of 40-watt T12 fluorescent lamps mounted end-to-end behind a narrow valance. Since

RECESSED SPOTLIGHTS in false ceilings surrounding the various structural columns deliver up to 200 footcandles on merchandise displayed either on vertical column surfaces or on the asymmetric platforms surrounding the bases.



INSTALLATION: Clerk's Office and Small Claims Court, New Britain, Connecticut
ARCHITECT AND ENGINEERS: Mendel Baldessari
CONTRACTOR: Bessoni Bros., New Britain, Connecticut
ELECTRICAL CONTRACTOR: Grem Electric Co., New Britain, Connecticut
FIXTURES: No. 5328 2-lamp louvered, 35°-25° shielding. Surface mounted.
LAMPS: Standard Cool White
SPACING: 8'-0"
CEILING HEIGHT: 12'-0"
INTENSITY: 85 footcandles average in service
WALLS: Birch plywood, natural
COUNTER AND FLOOR: Linoleum, jaspe color
UPPER WALL: Painted light tan
CEILING: Acoustical tile

Custom Comfort

. . . with Standard Lighting by **LITECONTROL**

This Clerk's Office and Small Claims Court has an open, uncrowded look, despite its small size. The atmosphere is pleasant, eyes are comfortable all day long. The key is relaxing, low-contrast interior decoration . . . and plenty of glare-free light by LITECONTROL. Fixtures by LITECONTROL are used throughout this New Britain, Conn., Court House.

Light intensity is high (85 footcandles), but brightness is low . . . every area gets the same plentiful yet gentle illumination. Louvers provide 35°–25° shielding. Light through the top of the fixture minimizes fixture-ceiling contrast.

LITECONTROL 5328 may be mounted on the ceiling, as here, or hung on pendants, in rows or individually. It's always easy to install. Louvers are rigidly framed, have no sharp edges, swing fully open from spring catches on either side for easy cleaning and relamping.

Efficient, versatile and flexible in mounting, LITECONTROL fixtures assure *custom lighting* in every installation . . . at *standard prices*. Basic fixtures can be modified or combined to meet every lighting need. Call or write your local LITECONTROL representative.

LITECONTROL *Fixtures*

KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

30 FOOTCANDLES of general illumination are obtained from lenses and outwardly-flared 4-lamp 8-foot surface-mounted Day-Brite luminaires, while intensities up to 150 fc are provided to clothing racks by concealed valance and cornice installations.

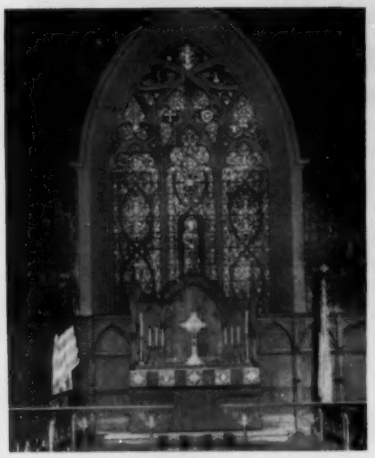
valances are open at the tops as well as the bottoms, spill light is also reflected on upper wall surfaces above display cases, thereby brightening these vertical panels and directing visual attention to raised-letter signs appearing thereon. Coats appearing in the glass-topped floor cases receive 150 fc on shoulders, the light emanating from 6-foot T8 warm white fluorescent lamps incorporated in the upper leading edge of the cases.

In the men's and boys' departments, the ceiling colors are respectively light grey and ivory; walls are variously ivory, yellow or light green; the flooring is either ivory or green; woodwork and valances are harmonizing shades of brown, while incidental chairs are upholstered in red leather.

Church Chancel Features Back-Lighted Window

Worshippers attending services in Saint Paul's Episcopal Church, Dedham, Mass., look forward toward a back-lighted stained-glass chancel window that rises above the impressive altar. And, since the general illumination within the Church is less than 10 footcandles on the average, the rich colors of this window, emphasized from without by artificial illumination whenever natural light is subdued or absent, constitute an inspiring center of interest during the services. The floodlighting installation, installed by electrical contractor Harold T. Weeks of Dedham, and designed by T. S. Williams of the Boston Edison Company, consists of thirteen 300-watt R-40 weatherproof floodlamps, mounted outside the window on a steel mast fitted with four angle-iron arms as pictured in the accompanying illustration. Sway braces run from beneath the second arm junction on the mast to either side of the window, where the angle-iron braces are secured to the wall by masonry anchors.

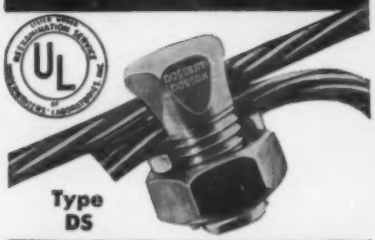
General illumination inside the Church is provided by ten 500-watt ornamental lanterns mounted 14 feet above the floor on a 20-by-12-foot spacing pattern. This installation is modest in scope yet effective in its results, combining ample illumination for incidental reading as well as esthetic beauty and color.



STAINED GLASS WINDOW above altar constitutes a beautiful focal point during services. Rich colors are emphasized by exterior floodlighting installation.

WEATHERPROOF REFLECTOR floodlamps are mounted on steel mast fitted with cross arms and sway bracing. Total installation has a 4-kw connected load.

JOINED for LIFE with **DOSSON** SERVICE CONNECTORS



The choice of connectors is wide, but there's a big difference when you choose a Dosson. Years of testing under the worst weather and corrosion conditions give undisputed proof of Dosson's permanent grip. Makes quick, simple, efficient connections for solid and stranded conductors in sizes No. 14 to 1000 MCM. High contact pressure between conductors assures maximum security . . . eliminates maintenance. Check these important Dosson features:

1) High translation of torque by low coefficient of friction
2) High contact pressure
3) Free from vibrational loosening
4) Withstands high tightening torque
5) Maximum contact area
6) Made of high strength "DURONZE" alloy
7) Better conductivity
8) High corrosion resistance
9) Economical—usable over and over again
10) Dossert precision-manufactured

IN STOCK FOR IMMEDIATE DELIVERY!

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT REPRESENTATIVES IN PRINCIPAL CITIES

DOSSERT MFG. CORP.
249 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904

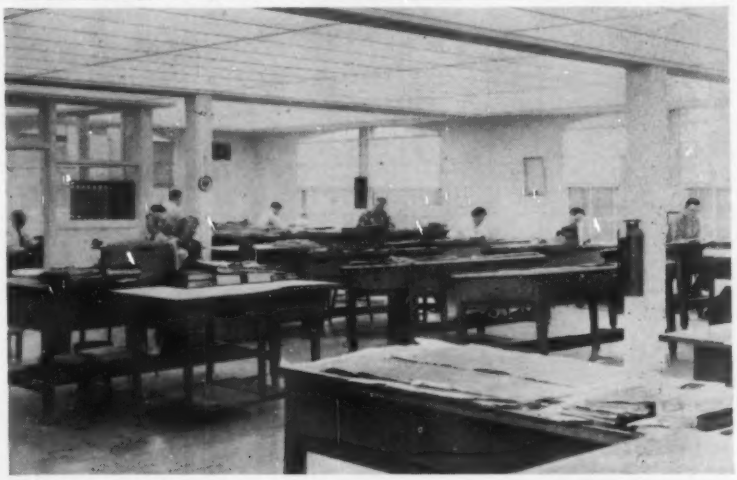
Coves, Lenses, Spots Light Office Lobby

One of our large midwestern office buildings has combined modern lighting techniques with modern decorative themes to achieve an interesting overall conversation-piece effect. Speaking in light terms, illumination on the receptionist's desk is 35 footcandles, on the vertical surfaces of the hanging display it is 50, on the pictures mounted along the far wall it is 20, and on open floor areas the illumination ranges between 15 and 18.

Two major cove treatments are included in the design, one extending around the reception center, the other along the wall directly over the picture display. In both instances cool white 40-watt T-12 fluorescent lamps are mounted end-to-end. Shielding is obtained in the central section by means of the cove lip, while diffusion is achieved along the wall installation by means of translucent plastic Lumitile panels suspended beneath the continuous troffer.

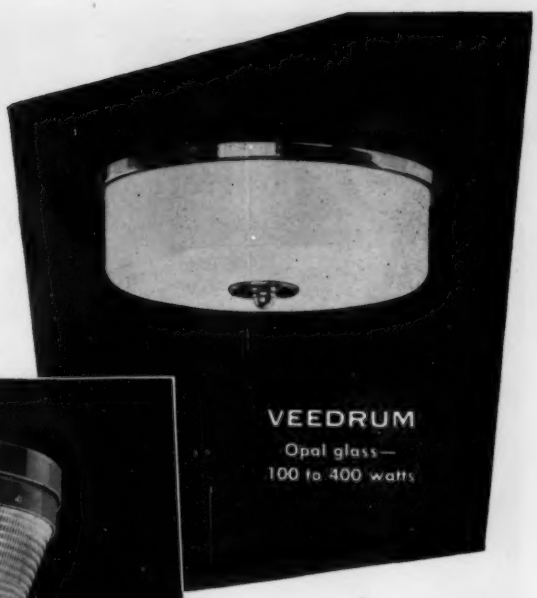
Square Curtis 2-lamp 100-watt filament units equipped with Albalite glass bottom plates are recessed into the dropped ceiling immediately adjacent to elevator doors, while five surface-mounted "cans" provide illumination for the receptionist's desk and the hanging displays behind it. Cans are lamped with 75-watt R30 incandescent bulbs and are shielded by means of concentric-ring louvers.

White acoustical plaster has been used on the ceiling, and walls are painted either grey or blue. The flooring is mottled grey rubber tile.



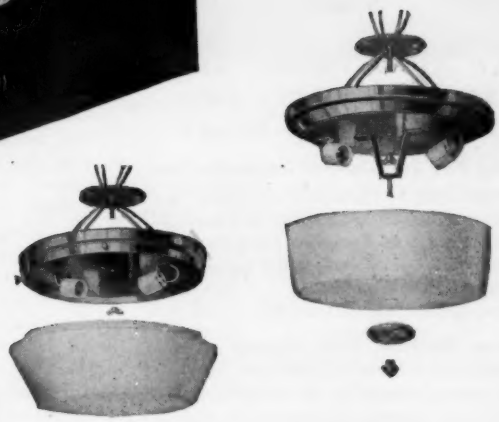
DRAFTING ROOM in Cleveland has a maintained lighting intensity of 120 footcandles. Engineering Department of Atlas Car and Manufacturing Company occupies 1800 sq ft of floor space (about 40% of space is shown above), and is lighted with Smithcraft "Area Illumination" using corrugated plastic diffusing panels. Fluorescent lamps are installed on 18-inch centers. Entire system was installed by Reserve Electric Company, Cleveland electrical contractors.

ART METAL DRUMS



VEEDRUM
Opal glass—
100 to 400 watts

LENSDRUM
Prismatic glass—clear glass bottom
200 to 300 watts



TAPERDRUM
Opal glass—
100 to 300 watts

SAFE!

- Approved by Underwriters' Laboratories, Inc.
- Tested for higher fixture wattage ratings.
- Connection to any standard building wire.

SAVE!

- Time saving installation.
- Time economizing maintenance.
- Time tested construction.

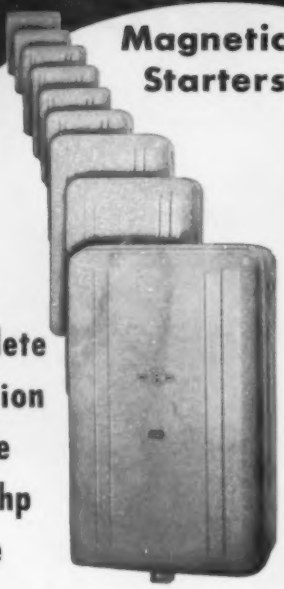
Consult your Authorized ART METAL Distributor or write for detailed bulletin.

THE **ART METAL** COMPANY
CLEVELAND 3, OHIO

Manufacturers of Engineered Incandescent Lighting

FURNAS ELECTRIC

Magnetic Starters



Your most complete selection in the 1-50 hp range

NEW "IN-BETWEEN" SIZES SAVE ON COSTS AND UP TO 40% IN SPACE

Why Pay for Starter Capacity You Never Use? Now you can select the exact starter size matched to any application in the 1-50 hp range from the nine Furnas Electric sizes. Many in-between sizes can save you money and conserve space. Immediate delivery from stock.

Same Service, Less Money—Here's an example of how you can save: Suppose you want a starter for 10 hp service. It's no longer necessary to select a size 2 rated 25 hp. You save in cost and up to 40% in space by selecting a Furnas Electric type YE, the right starter for the job.

Important Features—1. Dual voltage coils matched to your motor. 2. Four-speed thermal overload protection. 3. Easy installation and wiring in shallow case. 4. Heavy contacts for long life.

Complete Range of Other Products—Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for Bulletin No. 5402, giving the full story. Furnas Electric Company, 1067 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC
Batavia, Illinois

Optical Center Has Functional Lighting Plan

The width of this optical center (15 feet), plus the arrangement of fitting tables along one wall with hanging displays on the other side of the area, makes the crosswise installation of 8-foot fluorescent fixtures with adjustable spots at each end a logical solution to a functional as well as an esthetic problem in this 70-foot-deep commercial office in the Van Aken Center, Shaker Heights, Ohio, occupied by the Jones Optical Dispensing Company. General illumination of 45 footcandles is obtained from five recessed Varco "Harvard" fluorescent fixtures, each being lamped with two deluxe warm white F96T12 tubes and shielded by Holophane Controlens cover plates. Center-to-center mounting of these units is 8 feet, the ceiling height being 11 feet.

Adjustable incandescent floodlamps are 150-watt PARs, while light levels delivered to fitting tables by these highlighting media are 100 fc plus. Hanging displays along the right-hand wall, being closer to these incandescent light sources, are highlighted to intensities averaging 140 fc.

As to colors: the acoustical ceiling is white, asphalt tile flooring is green and coral, the left wall is natural blond wood veneer panelling, the right wall is light tan painted plaster, while furniture is upholstered leatherette in coral and ivory.

Observed through the rear plate-glass window is the laboratory where lenses are ground to prescription. This area, measuring approximately 14 by 17 feet, is generally illuminated to 100 footcandles by means of three 8-foot 4-lamp white-enameled louvered fixtures equipped with translucent side panels to provide shielding against glare.

AUTOMOBILE SERVICING area of the Fergus-Simpson Service Department, Evanston, Illinois, receives from 20 to 40 footcandles from 2-lamp, 8-foot Smithcraft luminaires, mounted 11 feet above floor. Aluminum foil insulation on the underside of the arched roof affords maximum reflectivity, aided by white-painted upper walls. Lamps in the fixtures are cool white T12's, while reflectors are enameled white inside and out.

MITCHELL

LODESTAR

4-FOOT MODELS:
Available in 2 or 4 lamp luminaires, in a complete choice of all lamp types.

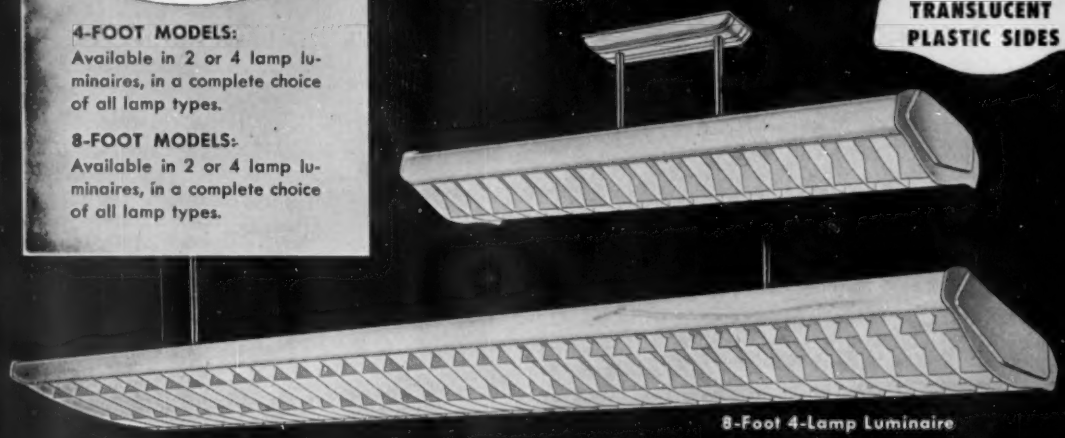
8-FOOT MODELS:
Available in 2 or 4 lamp luminaires, in a complete choice of all lamp types.

the new LOW COST fluorescent luminaire with

UPWARD COMPONENT

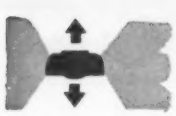
TRIM MODERN APPEARANCE

TRANSLUCENT PLASTIC SIDES



8-Foot 4-Lamp Luminaire

Outstanding lighting advantages and low-cost maintenance

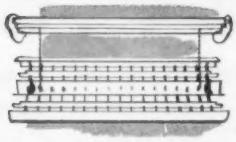


"General Diffuse" type luminaires; approximately half the light goes up to be reflected from ceiling and upper walls for comfortable, glare-free, uniform lighting.

Semi-translucent side panels provide low brightness contrast, creating modern, streamlined appearance. Plastic sides and louver form one easy-to-handle unit.

Sturdy, concealed spring-loaded louver latch instantly releases or engages all-steel louver by snap-in action. Releases with slight pressure of fingers.

MITCHELL engineering achieves remarkable standards of abundant, glare-free illumination in the "LODESTAR" Luminaires. Important lighting advantages are attained by the substantial upward component which provides a "general diffuse" lighting effect. Semi-translucent side panels provide pleasing low brightness contrast. The superior louver design delivers properly shielded illumination to the working area. Smooth styling, unusually low maintenance factor and surprisingly low cost make the new MITCHELL "LODESTAR" Luminaires outstanding values in commercial fluorescent lighting.



Two jack chains suspend entire louver and V-spine assembly from fixture body, making relamping easy and substantially reducing maintenance costs. This feature saves time and money.

New Rapid-Start units offer an unusual advantage: "No starters to replace." Installation of Rapid-Start luminaires slashes maintenance cost by eliminating starter replacement expense.

where quality counts—SPECIFY MITCHELL

MITCHELL MANUFACTURING COMPANY
2525 N. Clybourn Ave., Chicago 14, Illinois
In Canada: Mitchell Mfg. Co., Ltd., 19 Waterman Ave., Toronto

MITCHELL

Mitchell Manufacturing Company, Dept. 2-E
2525 N. Clybourn Ave., Chicago 14, Illinois

Send full data on MITCHELL "Lodestar" Luminaires.

Name.....

Firm.....

Address.....

City.....Zone.....State.....

The smooth, blue interior finish of the new G-E WHITE rigid steel conduit makes fishing and wire-pulling easy.

Easy fishing and wire-pulling with new G-E WHITE rigid conduit

The new G-E WHITE rigid steel conduit is lined with a new corrosion-resistant coating, containing a special antifriction agent. This smooth, blue interior surface lets wires slide easily, and cuts fishing and wire-pulling time.

New G-E WHITE also offers easy bending and improved corrosion protection because it is zinc galvanized by the "metallizing" process. This process bonds a uniform coating of pure zinc to the entire outside surface of the conduit, including threads.

New G-E WHITE metallized conduit, with its completely new interior and exterior finishes, is listed by Underwriters' Laboratories, Inc. Ask your distributor about it, or write Section C35-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

GENERAL ELECTRIC

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

Please send me without obligation further information about the following: 5/54

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME..... TITLE.....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication
NOT GOOD AFTER JULY 1, 1954

Please send me without obligation further information about the following: 5/54

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME..... TITLE.....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication
NOT GOOD AFTER JULY 1, 1954

IMPORTANT . . .

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

Your Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

is increased to about 95% by the power factor correction unit included with the converter. Provision is made in the converter connection block for connection of the pf correction unit at the output side of the line switch, thus allowing the unit to be turned off and on with the basic equipment.

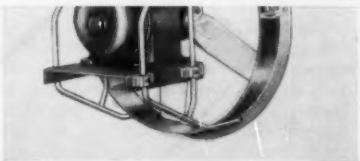
Standard 60-cycle wiring of proper insulation can be used to deliver power to the load. The output circuit is equipped with a center-tapped reactor so that a third wire may be used to reduce line-to-ground potential.

General Electric Company, Schenectady 5, N. Y.

Coded Signal Receiver (2)

New coded signal receiver is designed to extend automatic operation of signals, they will control automatically any ¼, ½, ¾, or 1-hp room air conditioners. They are equipped with a 4-foot, 14 gage, 3-wire type "S" cord set with rubber, three way, grounded male plug. Two models are available. P691 is for 125-volt operation. Cord set is equipped with an adapter plug so it can be used on either a 2-wire or 3-wire system. A three-way universal receptacle is mounted on right side of case. Model P692 is for 250-volt 3-wire systems. Series P690 incorporates the Inter-Matic "skipping" device which permits the skipping of automatic operation of time switch on Saturdays, Sundays, holidays, or other selected days of the week. Up to 11 on-off operations per day. Timing range is one to 23 hours, approved by UL. Catalog NR14 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.



Fans (5)

A heavy duty direct driven fan for industrial application and service industries where a large volume of air is required under static pressure. Ring mounted units are available in diameter sizes from 12-in. delivering 980 CFM of air, to 48-in. diameters delivering 32,400 CFM of air. Totally enclosed motors are furnished with the fans.

M & E Manufacturing Co., 2533 Winthrop Ave., Indianapolis 5, Ind.

PLACE 2¢ STAMP HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

PLACE 2¢ STAMP HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

***Your Name** and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.*

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

rior surface lets wires slide easily, and cuts fishing and wire-pulling time.

New G-E WHITE also offers easy bending and improved corrosion protection because it is zinc galvanized by the "metallizing" process. This process completely new interior and exterior finishes, is listed by Underwriters' Laboratories, Inc. Ask your distributor about it, or write Section C35-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

GENERAL ELECTRIC

Product News

Converter (1)

A 5-kw static frequency converter that provides 360-cycle square-wave current at 600 volts for high-frequency operation of fluorescent lamps. Designed particularly for such applications as experimental and commercial plant growth rooms, television and radio studios, luminous ceiling and libraries, the converter increases light output and assists in the lowering of heat loss. Fixtures in the system are lighter and smaller. The completely packaged unit combines the functions of a frequency converter, step-up transformer, current regulator, and square-current generator.

It was developed to start and operate 50 - 96T8 or 96T12's with a 0.33 microfarad capacitor in series with each lamp. With this combination, lamp current can be regulated by a single knob in the range of 300 to 500 ma.

Conversion is accomplished in three stages: the first stage changes the 480-volt, 60-cycle, 3-phase input to 180 cycle, single-phase; the second stage doubles this frequency to 360-cycles; and the third stage corrects waveshape and gives load-regulation feature.

The power factor of the load drawn from the static frequency converter, which lags approximately 30% at full load, is increased to about 90% by the power factor correction unit included with the converter. Provision is made in the converter connection block for connection of the pf correction unit at the output side of the line switch, thus allowing the unit to be turned off and on with the basic equipment.

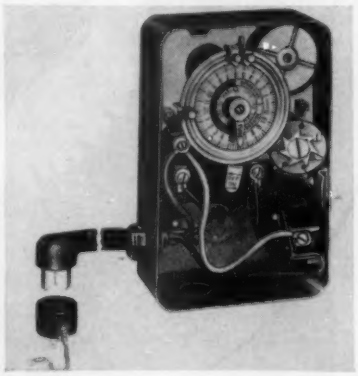
Standard 60-cycle wiring of proper insulation can be used to deliver power to the load. The output circuit is equipped with a center-tapped reactor so that a third wire may be used to reduce line-to-ground potential.

General Electric Company, Schenectady 5, N. Y.

Coded Signal Receiver (2)

New coded signal receiver is designed to extend automatic operation of signals, relays, circuit breakers, switches, and other electro-mechanical devices in remote locations according to pre-selected programs. They are controlled by code pulses transmitted over regular ac lighting wires when used with an IBM electronic time and program control system and by electrical impulses when used with wired time systems. Code pulses are transmitted automatically to individual receivers by an IBM transmitter unit. The first code pulse activates a code selector mechanism in all receivers tuned to the frequency being transmitted. The second pulse selects those units which are to function, the time interval between pulses determining which receivers will operate. Signal receiver is pre-set in each receiver. Applications include minute-by-minute automatic control of audible signals, heating and air-conditioning systems, flush valves, lighting systems, water-flow equipment, and other utilities.

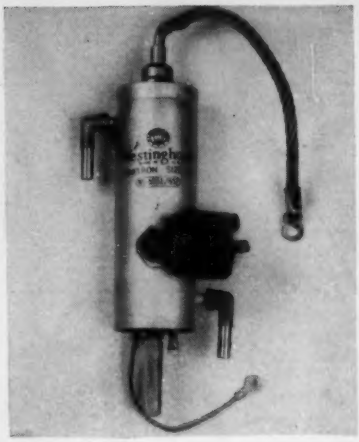
International Business Machines Corp., 590 Madison Avenue, New York 22, N. Y.



Time Switches (3)

Portable plug-in time switches designed especially for automatic control of room air conditioners. Known as Series P690, they will control automatically any ⅓, ½, ¾, or 1-hp room air conditioners. They are equipped with a 4-foot, 14 gage, 3-wire type "S" cord set with rubber, three way, grounded male plug. Two models are available. P691 is for 125-volt operation. Cord set is equipped with an adapter plug so it can be used on either a 2-wire or 3-wire system. A three-way universal receptacle is mounted on right side of case. Model P692 is for 250-volt 3-wire systems. Series P690 incorporates the Inter-Matic "skipping" device which permits the skipping of automatic operation of time switch on Saturdays, Sundays, holidays, or other selected days of the week. Up to 11 on-off operations per day. Timing range is one to 23 hours, approved by UL. Catalog NR14 is available.

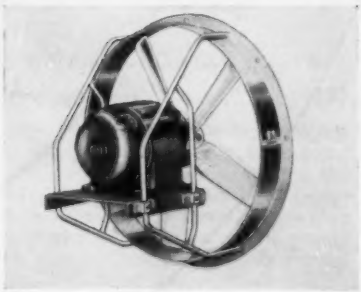
International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.



Ignitron (4)

Provision for thermostatic control of cooling water is supplied on a new model, Size B ignitron (WL-5551-A). It is a sealed, stainless-steel jacketed, water-cooled, mercury-pool tube. It is capable of replacing the standard model WL-5551 directly, with the advantage of provision for suitable thermostatic control. A calibrated thermostat, attached to the mount provided on the side of the tube, may be used to stop tube operation in case of insufficient water flow, or may be used with a solenoid water valve to turn cooling water on and off as needed. Tube is designed primarily for resistance welding control.

Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.



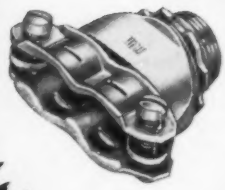
Fans (5)

A heavy duty direct driven fan for industrial application and service industries where a large volume of air is required under static pressure. Ring mounted units are available in diameter sizes from 12-in. delivering 980 CFM of air, to 48-in. diameters delivering 32,400 CFM of air. Totally enclosed motors are furnished with the fans.

M & E Manufacturing Co., 2533 Winthrop Ave., Indianapolis 5, Ind.

midwest

MODERN FITTINGS

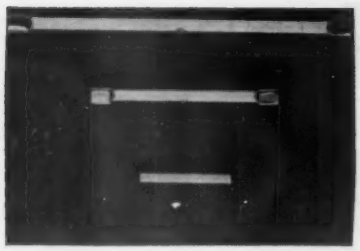


Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

Chicago 12, Illinois



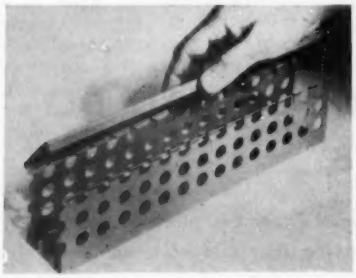
Infrared Lamp (6)

Available for scores of electrical heating applications—heating, drying, baking, cooking, and other uses—is a revolutionary new type of infrared lamp. It is a compact tubular shape, only slightly larger in diameter than a cigarette. Tube is made of fused translucent quartz, and contains a coiled tungsten filament as a heating element, which operates at about 4000° Fahrenheit.

Two sizes of lamps are available: 500 and 1,000 watts, for use on circuit voltages of 115-125 and 230-250, respectively. The 500-watt size has a "lighted length" of five inches, and the 1,000-watt size ten inches. Metal clips on either end add about 1¾ inches to the overall length. A flexible 6-inch lead wire extends from each end.

The new lamps produce full radiation immediately, it is claimed, without a warm-up period. They produce some visible radiation, as well as infrared radiation. They are light in weight and require little maintenance. Rated life is listed as more than 5,000 hours.

General Electric Co., Nela Park, Ohio.



Wiring Duct (7)

A newly designed wiring duct made from a thermoplastic material, and its chemical and physical properties are similar to those of machine tool wire insulation. Cover snaps on and off. Clips, inserted at regular intervals, hold wires firmly and eliminate lacing of harness in wiring and maintenance. Available in lengths up to 45 inches.

Taylor Electric Inc., 15460 Dale, Detroit 23, Mich.

Weatherproof Boxes (8)

The FSW Series weatherproof boxes, covers and device assemblies are available as complete assemblies, including devices —switches and receptacles. The FSW fitting measures 4⅝-in. long by 2½-in. wide by 2⅛-in. deep. This allows for ample, convenient wiring space. Constructed of Alumalloy, they are non-rusting.

Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

Outdoor Lighting Unit (9)

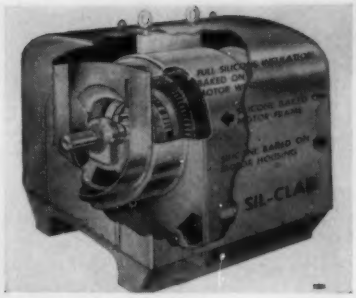
New outdoor unit No. 415 is for lighting of public areas, industrial buildings and residences. Metal parts are die-cast aluminum with a lacquered finish. The double thick prismatic refractor and functional bracket-hood are perfectly proportioned. Glass assembly is composed of hundreds of glass prisms built to optical standards to direct light downward and outward for wide coverage and to produce a uniformly lighted appearance. Hood is constructed to withstand all weather conditions, and is impervious to dust and rust. For relamping, door screws are loosened, and glass assembly swings open on concealed hinge.

Holophane Company, Inc., 342 Madison Ave., New York 17, N. Y.

Displays (10)

Plastic displays designed especially for Light's Diamond Jubilee. The one illustrated is 36-in. by 48-in. in size. The diamond can be used separately and comes in three sizes, 12-in., 30-in. and 48-in. either as a half against a wall or two halves to make one three dimensional display. It contains an opening to allow for a lamp. Background and raised plastic letters come in gold, red, blue, green, yellow, and white. They are adaptable for indoor and outdoor use.

Solar Plastic Products Co., 1635 East 16th Street, Brooklyn 29, N. Y.



Induction Motors (11)

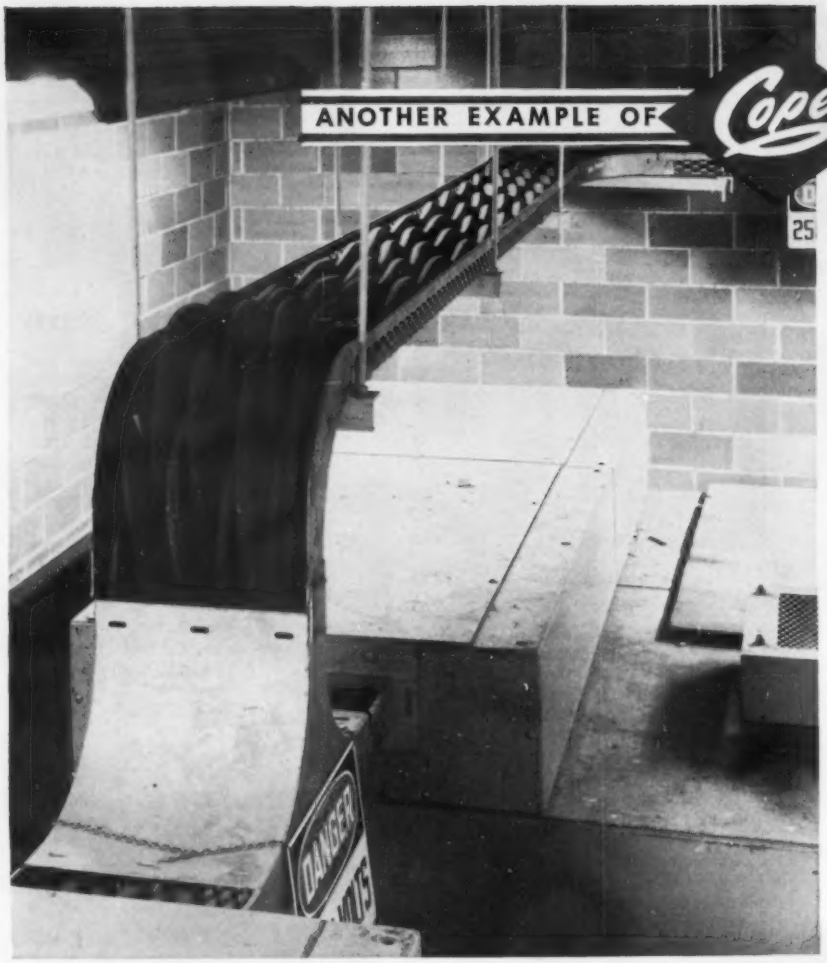
Full protection against moisture and corrosion is provided in a new line of weather-protected squirrel-cage induction motors called "Sil-Clad". They feature Silicone insulation on motor winding. Silicone enamel baked on all exposed metal part of motor, and stainless on parts subject to air abrasion. The full Silicone treatment of motor is especially designed to provide protection in damp, moist, or steamy conditions, in sea coast locations subject to salt corrosion, in chemically active atmospheres or in other situations which include deterioration by rusting, corroding or moisture. Available in ratings of 250-hp and larger. Publication No. 209 is available.

Electric Machinery Mfg. Co., Minneapolis 13, Minn.

Floodlight (12)

A new Intenso floodlight line for lighting athletic fields and other large areas. A rear lamp-holding section lifts up and forward for servicing. Secured by cam-action flip-clamps, this rear section may be released and swung out of the way in less than five seconds, providing wide-open access to any part of fixture interior. Other features include: a "straight-thru" peep sign for aiming and positioning of lamp during daylight installation; hooded louvers for cross ventilation; locking degree indicators; heat and impact-resisting clear glass lens; heavy gauge steel yoke for support on pole; Alzak heavy gauge aluminum construction and corrosion-resistant reflector. Units come in 20- to 90-degree beam spreads, with 18-inch or 20-inch etched or polished reflectors.

Appleton Electric Co., 1701-59 Wellington Ave., Chicago 13, Ill.



A SINGLE RUN OF COPE CABLE TROUGH CAN DO A MAN-SIZED JOB

The above photograph, taken in a section of the new Scott Paper Co. plant at Everett, Washington shows one run of Cope Cable Trough carrying four sets of three phase triplexed cable carrying 2300 volts properly spaced to give a free-air rating.

Because of its low cost and ease of installation, Cope Cable Trough is extremely popular as a standardized system for supporting power and control circuits in the industrial and utility field.

Cope Cable Trough is available in straight runs and a wide range of fittings (tees, elbows, drop-outs, etc.) which enables the entire system to be quickly and easily erected at the job site to conform to any layout.

Write today for further information. Ask for Bulletin 5M.

You know Cope by these products

Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Tool (13)

A new powder-actuated tool, called "Super-Power Jobmaster," designed to drive heavy shank fasteners into structural steel plates up to an inch thick and into concrete. Pins and studs driven into one-inch structural steel have a holding power up to 10,000 pounds. It weighs less than eight pounds and is 15 inches long. It is designed for either one-hand or two-hand operation and sets pins and studs ⅜ inch in thread or head diameter at an average rate of one or more a minute. It uses any of 19 Ramset-designed fasteners, and has a choice of four powder loads. A new circle-set shield is a feature of the tool. It permits the setting of fasteners as close as 1¼ inches from edge of shield. Shield has quadrant markings for exact positioning and may be converted to half-shield position in an instant.

Ramset Division of Olin Industries, Inc., 12117 Berea Road, Cleveland, Ohio.

Service Entrance Cap (14)

The Multi-Grip entrance head will fit either thinwall or threaded or threadless heavywall conduit. It slips over the top end of the pipe and fastens in place with two screws. They are made of Alumalloy and are designed with plenty of wiring space for ease of installation. They are easy to install because conduit need not be pulled away from the building.

Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

Thermostat (15)

A new heavy-duty thermostat for accurate control of temperatures in areas where dust, corrosion and humidity are a problem. It will control gas, oil or stoker fired heating plants. It features corrosion-resistant parts and sealed Micro switch contacts. The liquid-filled temperature sensing element is coiled within the cover for protection from damage, ease of cleaning and maximum sensitivity. Control range is between 35 and 100 degrees. A switching action is provided so it can also be used to regulate building ventilating systems. Thermostat may be mounted on a flat surface or, by using special mounting straps, can be installed on a beam or post.

Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S., Minneapolis 8, Minn.

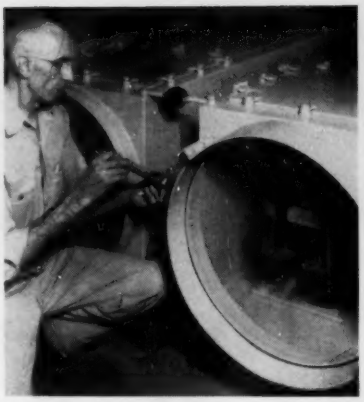
Instrument (16)

The "Cap-Subber" is a new device designed to act as a substitute for any motor-starting capacitor and permits immediate restoration of service until a replacement capacitor is obtained. When the rating of a worn-out capacitor is unknown, the Cap-Subber acts as a rating selector and determines the correct capacitance. Easy to operate, a series of five switches thrown in various combinations will provide a substitute for any capacitor from 21 mf to 648 mf. It is housed in a gray steel case measuring 9-in. high by 6-in. wide by 2½-in. deep. Designed for 115-volt, 50-60 cycle-operation. Manual C-910 is available.

Sprague Products Co., 333 Marshall St., North Adams, Mass.

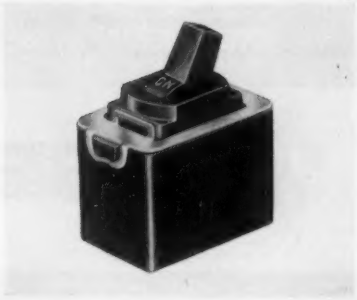
Unit-Supported Bus (17)

A new unit-supported bus of the isolated phase design, capable of withstanding high short circuit currents of modern power systems and having a margin for future system growth. Bus is generally used for direct connection of generators and main power transformers in a unit generation system. Use of single supports was made possible because metal sheath around bus keeps lines of force due to magnetic flux from acting between conductors. An area of "zero force" exists at center of enclosure, and conductors located at this point require a minimum of



support. Other features for simplifying maintenance include smaller covers with less gasketing area providing accessibility to insulator supports and connections, simplified hardware on covers for access to bus, a ground clip that slides back for testing, and welded end bells. New bus is available in lengths of three-phase sections up to 16 feet and ratings up to 10,000 amps, 14.4 to 34.5 kv.

General Electric Co., Schenectady 5, N. Y.



Switches (18)

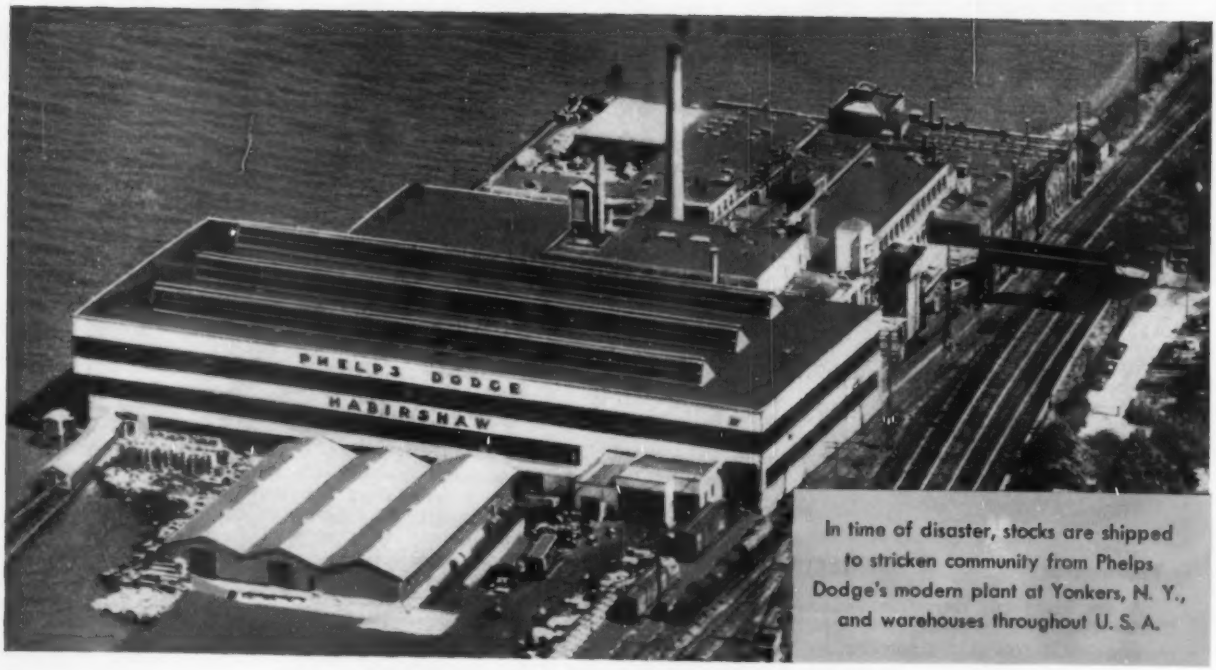
Two new lines of Quiette switches—the Junior for residential use, and the Interchangeable for specification works—featuring quiet mechanical operation, wire-lock screwless terminals, and small size. Wires need only be stripped and inserted into terminal holes. A tempered spring holds wires securely against a brass terminal groove. AWG No. 12 and No. 14 wires can be used. The Junior line is rated at 15 amperes, 120 volts ac only and is available in single and double pole, 3-way and 4-way types. The plateau design fits snugly without binding into wall-plate opening. The Interchangeable line is rated at 15 amperes, 120 volts or 277 volts ac only, and is available in single and double pole, 3-way and 4-way types. The single pole features a "line feed thru shunt" as standard. The channel-type construction of base plate or strap provides added strength and holds switch securely in place. The strap and all other exposed parts are zinc plated to resist corrosion.

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

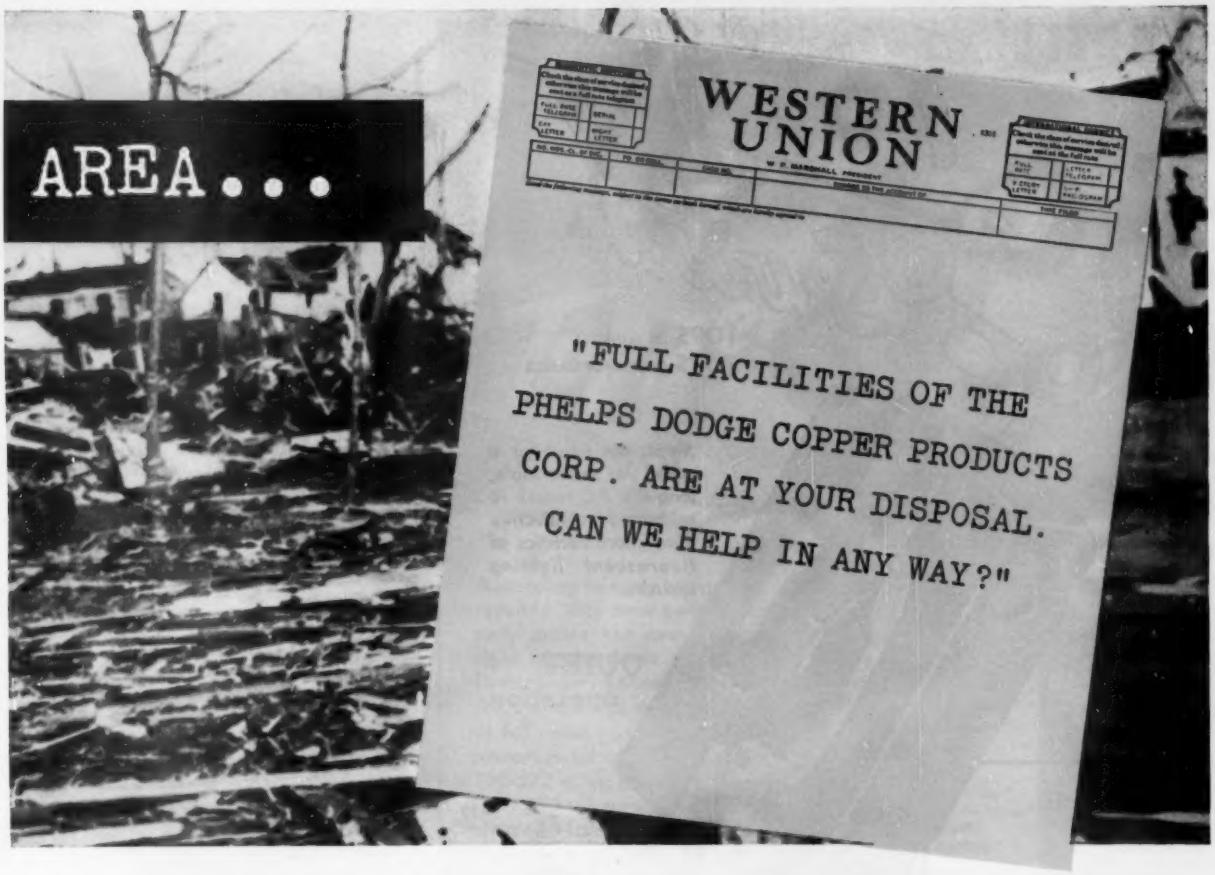
IF DISASTER STRIKES YOUR

When catastrophe hits a community, Phelps Dodge goes into action—rushes building wire and cable to local distributors in devastated area.

SEE YOUR PHELPS



In time of disaster, stocks are shipped to stricken community from Phelps Dodge's modern plant at Yonkers, N. Y., and warehouses throughout U. S. A.



DODGE DISTRIBUTOR!

Special Phelps Dodge service speeds delivery of vital wire and cable stocks to its distributors in hard-hit areas!

Telegrams like the one above are sent to Phelps Dodge distributors in areas hit by disasters. This special assistance plan is typical of the way in which Phelps Dodge cooperates closely with its distributors, assures them the finest service at all times.

PHELPS DODGE COPPER PRODUCTS CORPORATION

WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE!

HERE'S THE *NEW*
HUBBELL

AC Topper Switch

alternating current

TOPS IN QUALITY
TOPS IN PERFORMANCE

15 amperes,
120-277 volts

Meets the need for a quiet, yet dependable, long-life AC switch to withstand the inductive load characteristics of fluorescent lighting systems.

QUIET operation

OUTSTANDING FEATURES

- Meets and exceeds UL requirements
- Quiet operation (without mercury)
- Silver alloy contacts prevent corrosion
- Operates in any position
- Totally enclosed
- Designed for long life on full rated loads
- Back and side wiring utility
- "Upset" screws cannot come out
- Convenient strip gage
- Easy-to-find back wiring entry hole

Here it is . . . the newest addition to Hubbell's family of highest grade heavy-duty wiring devices. Quality designed for long-life dependability, the action is effortless and practically noiseless . . . the ideal answer for hospitals, nurseries, conference rooms, libraries, churches, bedrooms or other areas where quiet is essential to health and efficiency.

Write for the complete story today. Switch to Hubbell for quality.

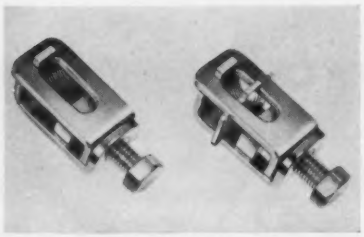
See Your Electrical Distributor.

Highest Grade
HEAVY DUTY
WIRING HUBBELL DEVICES

HARVEY HUBBELL, Inc.

DEPT. C-1
BRIDGEPORT, CONNECTICUT

15HH54



Tap Connector (19)

New tap connectors for all types of conductors, indoors or outdoors. An extra large pad and stirrup distribute the pressure over the entire connection area, reducing deformation of wire and making a low-resistance connection. It is a single unit and three sizes handle combinations from two No. 1 to one No. 8 and one No. 14 wire. Connector is available with or without spacer bars for connecting copper-to-aluminum or steel, or aluminum-to-steel cables. These bars are also attached to the unit.

Ideal Industries, Inc., 1041 Park Avenue, Sycamore, Ill.

Connector and Tool (20)

Two newly developed products for use on building equipment and appliance wiring, known as the "Nycap," a pre-assembled Nylon insulated splicing connector, and the "Nycapper" a light-weight versatile wiring hand tool. The "Nycap" is a complete unit assembly made up of two precision molded parts of FM-10001 Nylon, one a closed end sealing cap and the other an open conical skirt. "Nycaps" are approved for use on all combinations of solid and stranded wire from two No. 18 to 4 No. 12, and for high temperature applications up to 221°F. Installation of "Nycaps" and all preparatory cutting, stripping and twisting operations are accomplished with the new 8 in 1 "Nycapper." The new "TriDent" crimping action makes possible uniform splices on all combinations of stranded or solid wires from 2 No. 18 to 4 No. 12.

Buck Electrical Manufacturing Co., 139 Highland Parkway, Roselle, N. J.

Motor **(21)**

A new series motor, Model 512, has been announced. Also available as a shunt motor. Model 512 is die cast from zamak No. 3 and held to very close tolerances. Housing is ribbed for greater strength. Either porous bronze self-aligning sleeve bearings with oversize felt oil reservoir or precision grease sealed ball bearings are available. It is made in both open and closed construction. Typical applications include movie projections, radar equipment, railroad signaling devices, watchmaker's lathes, coil-operated vending machines, control mechanisms, etc.

Howard Industries, Inc., Racine, Wis.

Limit Switch **(22)**

A new two-circuit heavy-duty limit switch and a new two-circuit basic switch have been introduced. In the heavy-duty limit switch, 101ML1, the use of a snap-action spring accomplishes simultaneous make and break of both contacts (both normally-closed and normally-open circuits). Switch's aluminum enclosure makes it useful as a control of two isolated circuits in applications where switch is subjected to severe shock and impact. It is rated for 10-amp, 110, 220 or 440 volts ac and has a pilot duty rating of 6-amp, 125 volts ac. Two-circuit double-break basic switch, ITBI-1, is suited for reversing circuit applications where space is at a premium. Contact arrangement is single-pole, double-throw, two-circuit double-break. Rated for 10-amp 125 or 250 volts ac and 10-amp 30 volts dc, inductive.

Micro Switch, Div. of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

QUIET OPERATION

According to tests completed recently, this new switch not only meets but exceeds the rigid requirements set up by Underwriters Laboratories for AC switches. It may be used at *full rated capacity* on fluorescent loads at voltages from 120-277 v., on inductive loads (120-277 v.), on incandescent lamp loads, and on resistance loads for heaters, etc. In addition, it is highly practical for motor loads (120-277 v.) at 80% of current switch rating.

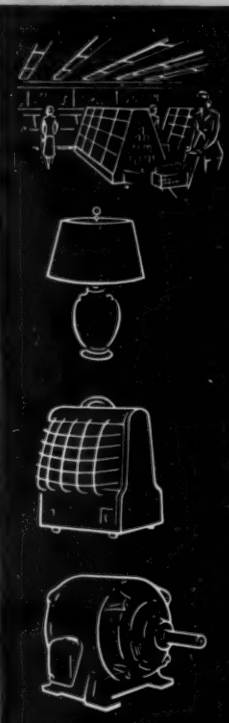
A feature of the new switch is the silver alloy contacts which prevent corrosion and hold temperature rise to an absolute minimum. Units may be used with any standard switch plate.

Withstands Inductive Loads at Full Rating
The economical answer for 277-volt instant-start slimline single-pin base fluorescent systems.

Withstands Inrush Loads at Full Rating
Inrush factor at least 8 times full rating of switch.

Withstands Resistance Loads at Full Rating
Silver alloy contacts hold temperature rise to a minimum.

Withstands Motor Loads up to 80% of Switch Rating
Practical for the control of motors and can be used up to 80% of rated capacity of the switch at 120-277 volts.



Write for complete information today.

Highest Grade
HEAVY DUTY
WIRING HUBBELL DEVICES

HARVEY HUBBELL, Inc.
DEPT. C-1
BRIDGEPORT, CONNECTICUT

16HH84

LOOK at this FIGURE

50%

Faster Spreading and Winding with a P & R Coil Spreader

★

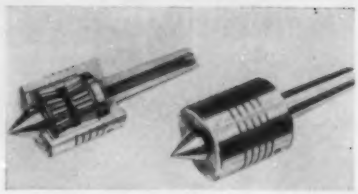
You'll begin to reap the rewards of far faster spreading as soon as you install a P&R Coil Spreader. Fully air operated—Eliminates Hand Operations—Cuts Operator Fatigue . . . Easily adjusted and operated . . . gives long, trouble-free operation. For complete information about this low-cost profitable item—

WRITE TODAY

CONVENIENT TIME PAYMENT PLAN AS LITTLE AS $56.66 MONTHLY

POTTER & RAYFIELD, INC.
Engineering Craftsmanship

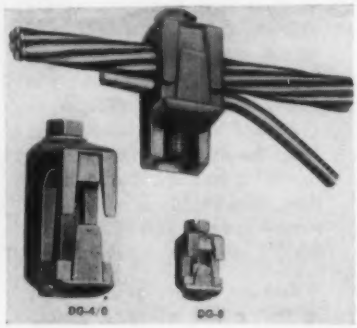
P. O. Box 1042 Atlanta, Ga.



Live Center (23)

A new live center known as "Universal," is designed to meet production demands for closer tolerances. Eccentricity tolerance is limited to plus or minus .0001-in. through the use of twin, precision-type roller bearings which are pre-loaded after assembly. The point is then ground in its own bearings after it has been inserted into the live center. A double seal is used. A stationary hycar sealing ring in an anodized aluminum cap keeps dirt and chips out. Grease is kept inside the center by a slinger rotating with the point. Live center is available with Morse Tapers from two to five for rotating speeds from 50-2000 rpm and maximum loads to 5200 pounds.

Ideal Industries, Inc., Sycamore, Ill.



Connector (24)

New Dura Grip connector series is designed to give users a wider range of use, with a minimum stocking of connector sizes. They are available in 8 sizes, from No. 8 stranded copper through No. 4/0 stranded copper. Sizes No. 6 and No. 8 are supplied with optional slotted type Hex head screws for screwdriver installation. Internal type phospor bronze spur lock-washers are provided on all sizes. "Jaws" on all sizes will open wide enough to install both main and tap conductors at the same time. New, interlocking design of "jaws" provide enclosure of conductor. They can also be installed with either end up.

Anderson Brass Works, Inc., Birmingham, Ala.

Rheostat (25)

A new 300-watt rheostat, Bulletin 1116, is for use in ac and dc circuits. Typical control applications include: generator and motor field, electron tube, battery charging, oven and lamp dimming control. Base and core consist of high dielectric strength ceramic. Vitreous enamel bonds the base to the core and permanently locks the special alloy resistance wire in place. Contact arm assembly features: balanced steel arm equipped with two sintered, self-lubricants copper graphite shoes; heavy compression spring, housed in a cold molded insulator; corrosion resistant, $\frac{1}{4}$-inch diameter steel shaft turns in a self-lubricating sleeve bearing. Dimensions are 6-in. diameter; back of panel depth $2\frac{3}{16}$-in. Resistance values range from 1 to 2500 ohms.

Ward Leonard Electric Co., Mount Vernon, N. Y.

Outlet Boxes (26)

A new series of 4-way heavy duty junction boxes. They employ heavy duty plugs and can be obtained in seven different combinations. Model No. 5001 has four 2-wire "T" slot outlets; No. 5002, two 2-wire "T" slot and two 3-wire straight type outlets; No. 5003, four 3-wire straight type outlets; No. 5004, two 2-wire "T" slot and two 3-wire twist lock outlets; No. 5005, four 3-wire twist lock outlets; and No. 5006, two 2-wire "T" slot and two 2-wire twist lock outlets. Cord on these six models is heavy duty type "S". Model No. 5000 has four 2-wire "T" slot outlets with regular cord. Cord comes in 15, 25, 50 and 100 foot lengths.

National Wire & Cable Corp., 136 San Fernando Road, Los Angeles, Calif.

Wedge Clamp (27)

A new service wedge clamp that permits formed 3-wire drop to be put up and sagged before the cable is cut. Available in two sizes that cover the conductor

KILLARK

EXPLOSION-PROOF PLUGS and RECEPTACLES

NON-SPARKING

Plug striking against receptacle can't cause a spark. Safety Time Delay prevents arcing even when improperly sealed. U. L. approved. Exceeds safety tests by a wide margin.

LIGHTWEIGHT

Ruggedly constructed of Killark ALUMALLOY. Durable, smooth, highly resistant to constant, rough usage.

RUST & CORROSION PROOF

Unaffected by various types of moisture, atmospheric conditions. Built for lifetime wear.

Available in many sizes and styles to fit various boxes, switches or pilot lights. Made in 15, 30, 60, and 100 amp. sizes.

the LAST WORD in SAFETY FIRST

for the electrical connection of portable equipment

KILLARK ST. LOUIS

Killark

ELECTRIC MANUFACTURING COMPANY

ENTRANCE FITTINGS • CONDUIT BODIES • FLUSH SWITCH FITTINGS • EXPLOSION-PROOF FITTINGS • VAPOR-TIGHT LIGHT FIXTURES • EXPLOSION-PROOF LIGHT FIXTURES • SEALED BEAM FIXTURES

Vandeventer and Easton Aves. St. Louis 13, Missouri

SALES OFFICES and WAREHOUSE STOCKS	Atlanta	69 Mills Street, N. W.	Dallas	1981 Griffin Street	Philadelphia	2014 Chancellor St.
	Boston	156 Purchase St.	Denver	1073 Galapago	Pittsburgh	50 26th St.
	Buffalo	18 Quay St.	Detroit	8319 Mack Ave.	San Francisco	714 Harrison St.
	Chicago	1528 West Adams St.	Los Angeles	412 Seaton St.	Seattle	4130 First Avenue South
SALES OFFICES	Baltimore	11 W. 25th St.	Columbus	2700 E. Main St.	Minneapolis	826-27 Andrus Bldg.
	Cincinnati	49 Central Ave.	Kansas City, Mo.	616 W. 26th St.	New York	600 W. 181 St.

Here's a good reason why
It's wise to buy
On over-all cost...
not price

I-T-E

Engineered for dependable, economical circuit protection

I-T-E Circuit Breakers restore service without fuss... without cost!

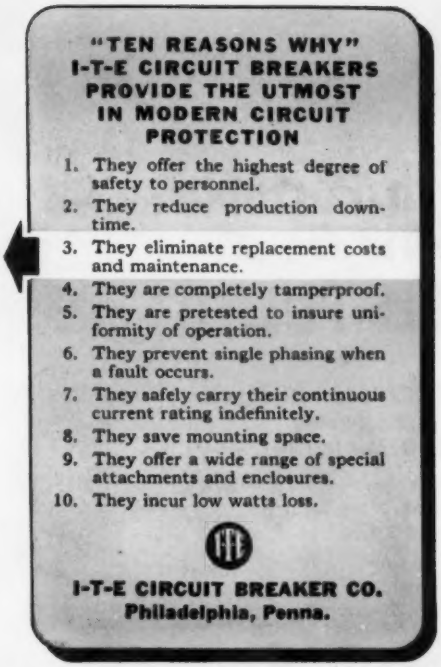
What *price* do you pay for electrical protection—say over a twenty year period? Probably much higher than you'd ever imagine.

Surprise you, if this high cost could be eliminated? I-T-E Circuit Breakers meet this need. By simply resetting the breaker handle, you can restore service immediately *—without fuss, without cost.*

There are no fusible elements to replace . . . no "hidden costs" to add to the original investment, and they outlive fusible protective devices.

For true economy—don't rely on initial price alone. Consider the *over-all* cost of electrical protection. Specify dependable I-T-E Circuit Breakers. They're engineered to *eliminate replacement costs and maintenance.*

I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.


"TEN REASONS WHY"
I-T-E CIRCUIT BREAKERS
PROVIDE THE UTMOST
IN MODERN CIRCUIT
PROTECTION
1. They offer the highest degree of safety to personnel.
2. They reduce production down-time.
3. They eliminate replacement costs and maintenance.
4. They are completely tamperproof.
5. They are pretested to insure uniformity of operation.
6. They prevent single phasing when a fault occurs.
7. They safely carry their continuous current rating indefinitely.
8. They save mounting space.
9. They offer a wide range of special attachments and enclosures.
10. They incur low watts loss.
I-T-E CIRCUIT BREAKER CO.
Philadelphia, Penna.

The other side of this handy pocket card tells you how to select I-T-E Molded Case Circuit Breakers for various feeder and branch circuits. Write for card and other application data, or see your local I-T-E Distributor.

I-T-E
Individually Enclosed Circuit Breakers

THE ONLY COMPLETE
WIRE-PULLING POWER TOOL

Makes you Money!

Barth Portable
powered
CABLE PULLER

Check these savings!

THE OLD MANUAL WAY!

Pushing the tape
1 Man pushing, 3 hrs.
1 Man fishing, 3 hrs.
} 6 MAN HOURS

Pulling the wire
1 Man Feeding, 1 hr.
2 Men pulling, 2 hrs.
} 3 MAN HOURS

Total Man Hours .... 9 HOURS

THE NEW CABLE PULLER WAY!

1 Man at Power Tool
1 Man at feed end
} 1 MAN HOUR

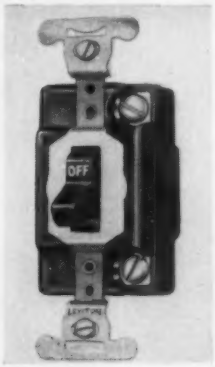
TIME SAVED 8 HOURS

AVAILABLE THRU YOUR NEAREST
General Electric Supply Co.
Graybar Electric Co.
Westinghouse Electric Supply Co.

The BARTH CORPORATION
12652 BROOKPARK RD., CLEVELAND 29, O.

range from 1/O ACSR to 6 solid. The aluminum shell is slipped around the bare neutral, then stainless steel wedge is inserted. Length of wedge and shell distributes load over long surfaces thereby avoiding possible damage to the conductor. For use with ACSR, this service wedge clamp is made with an aluminum shell and stainless steel wedge. For copper and Copperweld conductors, shell is bronze.

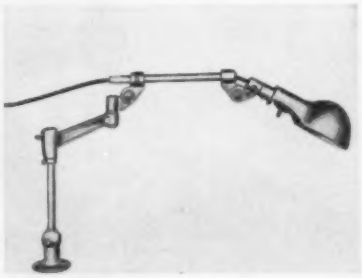
Reliable Electric Co., 3145 Carroll Ave., Chicago 12, Ill.



Switches (28)

A new line of 20-amp, 125 volt T-rated switches are available. They are completely inclosed in a heavily-sectioned phenolic housing. Rugged construction and strength has been designed to meet strenuous load conditions for commercial, residential and industrial applications. Available in single pole, double pole, and 3-way switches with ivory or brown toggles.

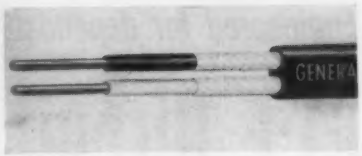
Leviton Manufacturing Co., 236 Greenpoint Ave., Brooklyn 22, N. Y.



Machine and Bench Lights (29)

A new and improved line of Sturdiflex machine and bench lights. Machine lights are designed for mounting directly to presses and other large factory equipment to provide localized lighting to relieve eye strain and operator fatigue. Fixtures are available in various lengths with adjustable joints to permit spotting light exactly where it is needed. Units feature a deluxe socket and a sturdy cast aluminum reflector designed for typical rough shop use. Reflector protects lamp against breakage and localizes lighting. Bulletin No. 126-54 is available.

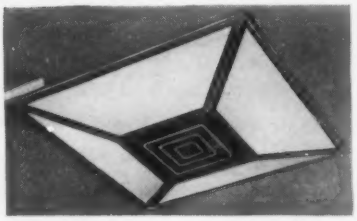
Steber Manufacturing Company, Broadview, Ill.



Cable (30)

A new Flamenol Type UF underground feeder cable has been announced. Suitable for underground wiring around homes, on farms, in light industrial areas, in storage yards, in parking lots, drive-in theaters, camps, and parks, this cable is easy to handle and install because of its light weight. It is available with one, two, or three conductors. It is recommended for installation in accordance with Article 339 of the NEC. Single conductor is available in sizes No. 14 through No. 4 AWG and is listed by Underwriters' Laboratories, Inc. as Type UF. Two- and three-conductor cables are available in sizes No. 14, 12, and 10 AWG and are UL listed as Type UF and Type NMC.

General Electric Co., Bridgeport 2, Conn.



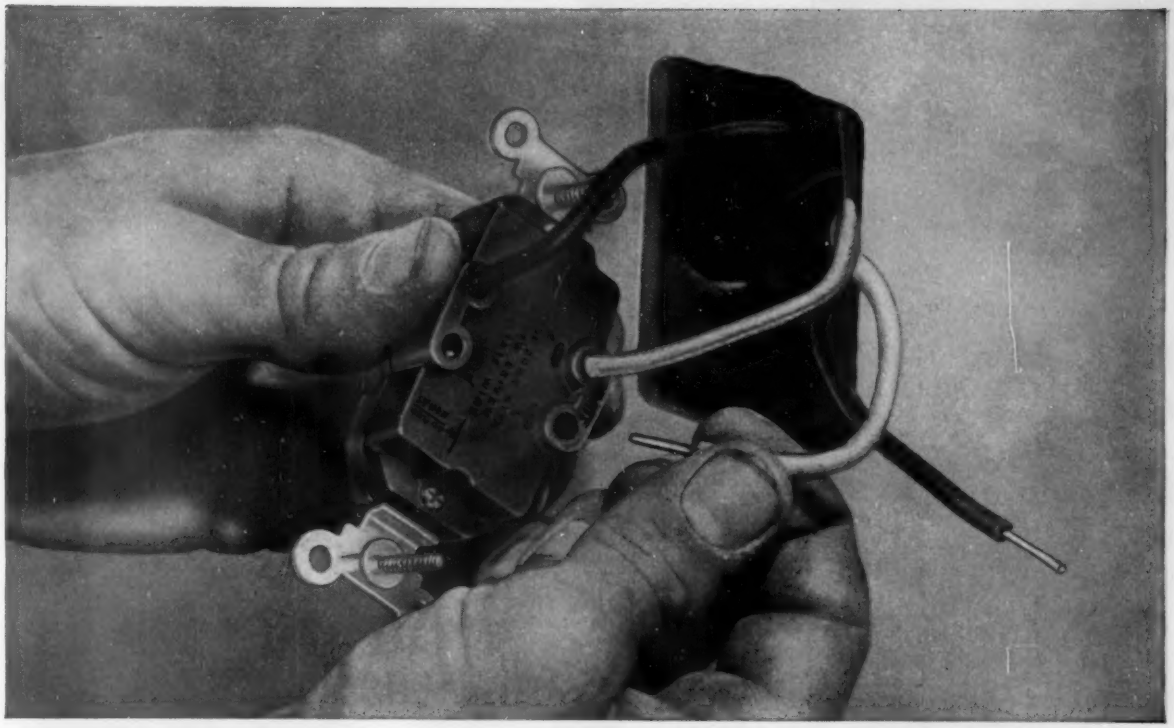
Fluorescent Unit (31)

A new fluorescent lighting fixture for large area lighting applications accommodates an air conditioning diffuser in its center. Unit, measuring 61 inches square, utilizes 24 fluorescent lamps in its inverted pyramid, Alba glass shielded body. Designed for surface mounting, it has a 24-in. by 24-in. opening through its depth, with lamps arranged in tiers on four sides of this opening. Opening provides insertion of standard dimension diffusers used with air conditioning ducts. Although fixture is well suited to many applications, either singly or in groups depending upon area to be lighted, it is particularly pointed to uses in commercial and institutional interior of very large area.

Gruber Lighting, 125 South First St., Brooklyn 11, N. Y.

Reversing Switch (32)

A new heavy duty double pole, double throw switch for reversing high currents at low voltage. It is rated 3000 amperes and is designed primarily to reverse the current flowing through a plating tank. Unit consists of two ebony asbestos panels mounted on angle iron supports, with manually operated handle. By placing the handle in a neutral position the line current can be disconnected. A total of



IT'S EASY TO WIRE GE3800-LINE DEVICES WITH EITHER NO. 10 OR NO. 12 AWG WIRES

GE3800-line outlets, switches and lampholders have G-E pressure-lock terminals. This means: no binding screws to loosen or tighten—no chance of destroying the device by stripping or mangling binding screws—and no need to loop or bend wires when you install these devices. Just strip off the insulation, push the wire into the terminal openings, and the G-E pressure-lock terminal grips the wire for a firm, dependable connection.

Cutaway view of GE3800-line outlet

Here's how GE3800-line devices work: Sturdy, corrosion-resistant locking springs hold the *entire* stripped length of the wires securely inside contact channels. These connections withstand a pull-out test of over 75 pounds with No. 14 Awg wire. Equally firm, positive connections are made with No. 12 and No. 10 Awg solid-conductor wire as well as No. 14 and No. 12 Awg stranded wire. All live parts are *completely* enclosed—hazards of shocks and short circuits are avoided. Vibration won't loosen connections—yet, when necessary, wires can be removed by inserting a screwdriver into release slots.

GE3800-line outlets and switches with pressure-lock terminals are available in both standard and intermediate grades. All GE3800-line devices are listed by Underwriters' Laboratories, Inc. and meet Federal Specifications.

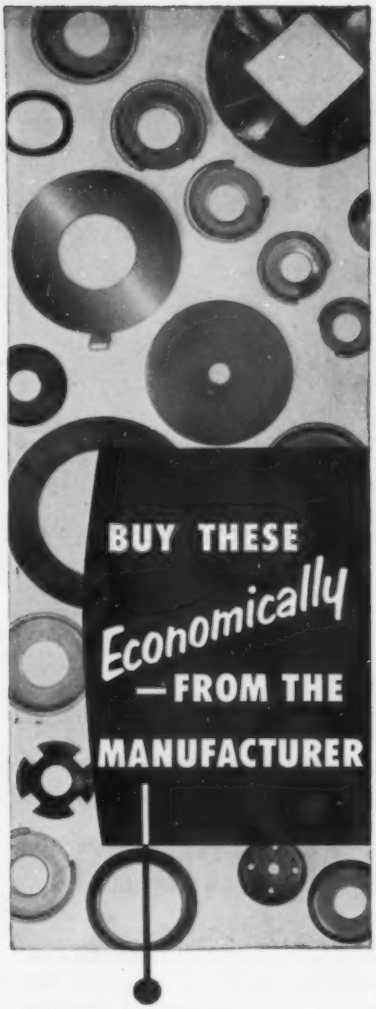
For a free folder on this new wiring development write Section D121A-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Ask your G-E Construction Materials distributor to demonstrate these new devices

You'll see immediately how G-E pressure-lock terminals solve device problems caused by the heavier wire requirements of new installations and circuit modernization jobs.

You can put your confidence in—

GENERAL ELECTRIC



When you're ordering CUP WASHERS for binding screws; FLAT WASHERS; SPRING TENSION WASHERS, spherical or form rim type, whether you want them made from spring brass, phosphor bronze, or spring steel, and tempered: *save yourself money by buying from the manufacturer.*

The Whitehead Catalog lists hundreds of washer sizes; cable clips; pipe, conduit, and wire clips; burrs, plugs, spacer shims, retainers, gaskets. Write for this catalog and—buy what you need from it—Economically!

WHITEHEAD STAMPING CO.
EST. 1903

1679 W. Lafayette Blvd.
Detroit 16, Michigan

16 heavy duty toggle-switches are mounted on panels, 8 for each current direction. The cam action of switch mechanism assures postive contact pressure. Contact surfaces are automatically cleaned by the inherent wiping of the laminated copper moving contacts. Switch is rear connected, and is furnished with reversing jumpers and four terminals for incoming bus.

Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio

Snap-on Pipe Strap (33)

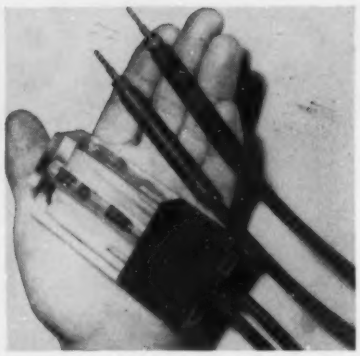
Installation ease, time economy and greater strength are reported claims for the new Minerallic hevi-duty Jiffy Clip one-hole pipe straps for thin wall or rigid conduit. Strap snaps on conduit and slides easily along pipe without falling off; leaves both hands free to align and fasten strap to structure either with screws, bolts or welding. Reverse groove at bend near base of cold rolled steel strap gives added strength and prevents breakage or bending at that point. Straps now available in sizes ½-in. through 1½-in. thinwall or rigid conduit. Later, after tooling is completed, these straps will be produced in standard sizes up to and including 6-in. rigid conduit.

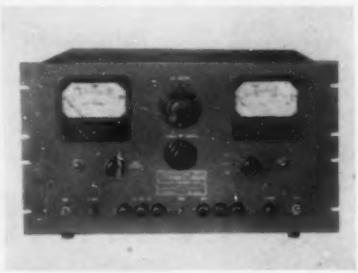
Minnerallac Electric Company, 25 North Peoria St., Chicago 7, Illinois

Voltage Tester (34)

A new electrical voltage tester, Model AP 1, for testing circuits from 90 to 600 volts. By substituting an electronic means for a mechanical one, the voltages can be separated by large, easily distinguished marks. It is made of plastic. The operating section is transparent, so that it can be seen from any angle; a low voltage lighting only the bottom part, the higher voltages causing the light to climb up the tube, giving the voltage indication the way a thermometer shows temperature. It will give an accurate voltage indication on all frequencies from dc to 400 cycles on the same scale, and indicate polarity on dc.

Craft Laboratories, P. O. Box 606 Westfield, N. J.

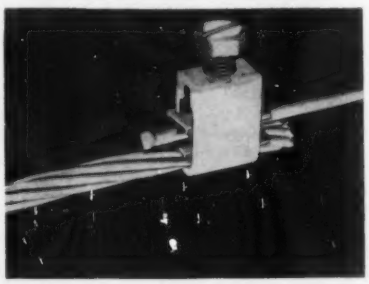




Power Supply (35)

New Regatron series provides, in one unit, a variable dc voltage standard, a high powered super-regulated power supply, and a research voltage source with small signal modulation, in single chassis, standard relay-rack or table models. DC voltage, 0 to 600 volts vernier calibrated on a 10 turn precision potentiometer to 0.25%. Current ratings available, 0-600 or 0-1,000 ma. Regulation 0.5%. Auxiliary bias and filament potentials are included.

Electronic Measurements Company, Inc., Lewis St. and Maple Ave., Eatontown, N. J.



Connectors (36)

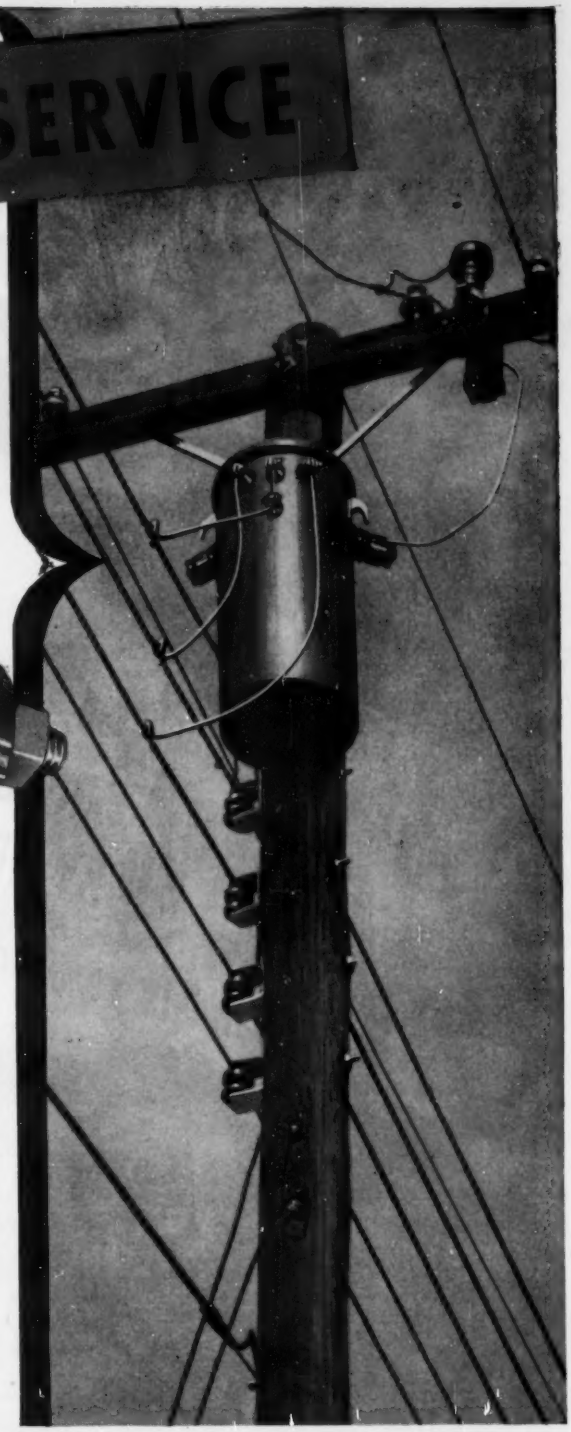
Two newly designed service entrance connectors are for aluminum-to-aluminum and aluminium-to-copper conductors. The bodies are extruded aluminum, cadmium plated to eliminate oxidized con-

for LIFETIME SERVICE

Specify ANDERSON

TRANSFORMER GROUND CONNECTORS

TYPES GTCS and GTCL



ABW DESIGN MEANS QUALITY Plus STRENGTH in the RIGHT PLACES!

THESE bronze transformer tank to cable ground connectors have been designed and made to *complete* a long-life installation! Both types are designed to withstand Mercururous Nitrate Specifications ASTM B-154-51 and the more severe ABW 124-1, which gives you extra, *added* insurance against stress corrosion and seasonal cracking.

In these connectors, like all Anderson products, *the perfect balance* of base metal and alloy is determined by exhaustive engineering and design testing . . . to insure "on the job" safety and continuity of service far beyond ordinary requirements. This extra measure of quality-control is your protection.

Consult one of our nearest 20 representatives or write, wire or telephone our home office.

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

BRONCO 40

always tops in its class...

now jacketed with 40% RUBBER BY WEIGHT and is so branded!

BRONCO 40 — 40% RUBBER BY WEIGHT

The only 40% rubber-jacketed portable cord with branded jacket. And it is self-measuring, too—branding is repeated every two feet!

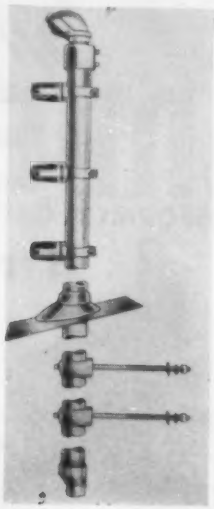
BRONCO 40 is recommended for inside, non-oily locations. Where severe conditions are encountered and maximum protection is required, the cord and cable to specify is BRONCO 40 *CERTIFIED* with 60% by weight *Neoprene* branded jacket.

SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS

Manufactured by WESTERN INSULATED WIRE CO., Los Angeles 58 • California

tact surfaces. Two spacers are used, the first spacer under the screw protects the one conductor from the screw while the second spacer separates the conductors. Opposing spacer surfaces are grooved to line up the conductors. For aluminum-to-aluminum, the spacers are cadmium plated while for aluminum-to-copper, two true bi-metal spacers are used.

Reliable Electric Co., 3145 Carroll Ave., Chicago 12, Ill.



Mast **(37)**

A complete service entrance mast assembly for ranch type buildings is now available. In a 7-ft. length of 2-in. galvanized pipe, the mast comes in a single package complete with all necessary fittings ready for installation. Designed especially for the low-roofed ranch type building, the mast makes possible a service entrance that is easy to install. It may be enclosed in construction or mounted on exterior. Literature is available.

Blackhawk Industries, Dubuque, Iowa.

Garage Door Operator **(38)**

The new Door-O-Matic garage door operator fits all overhead doors, and has only two mounting points. Door can be automatically raised or lowered from house, garage or car. For operation from car, either radio control or electromagnet control methods may be used. In electromagnet method, a magnetic switch under surface of driveway is operated by an electromagnet under front of car. A push-button inside the car completes circuit

to electromagnet. Other features include all welded-steel construction, V-belt drive to motor, adjustable friction clutch, positive roller chain to door, and an electric light which turns on when door starts to open and remains on until door is closed.

Door-O-Matic Co., 101 Main St., Russia, Ohio

Doorless Phone Booth (39)

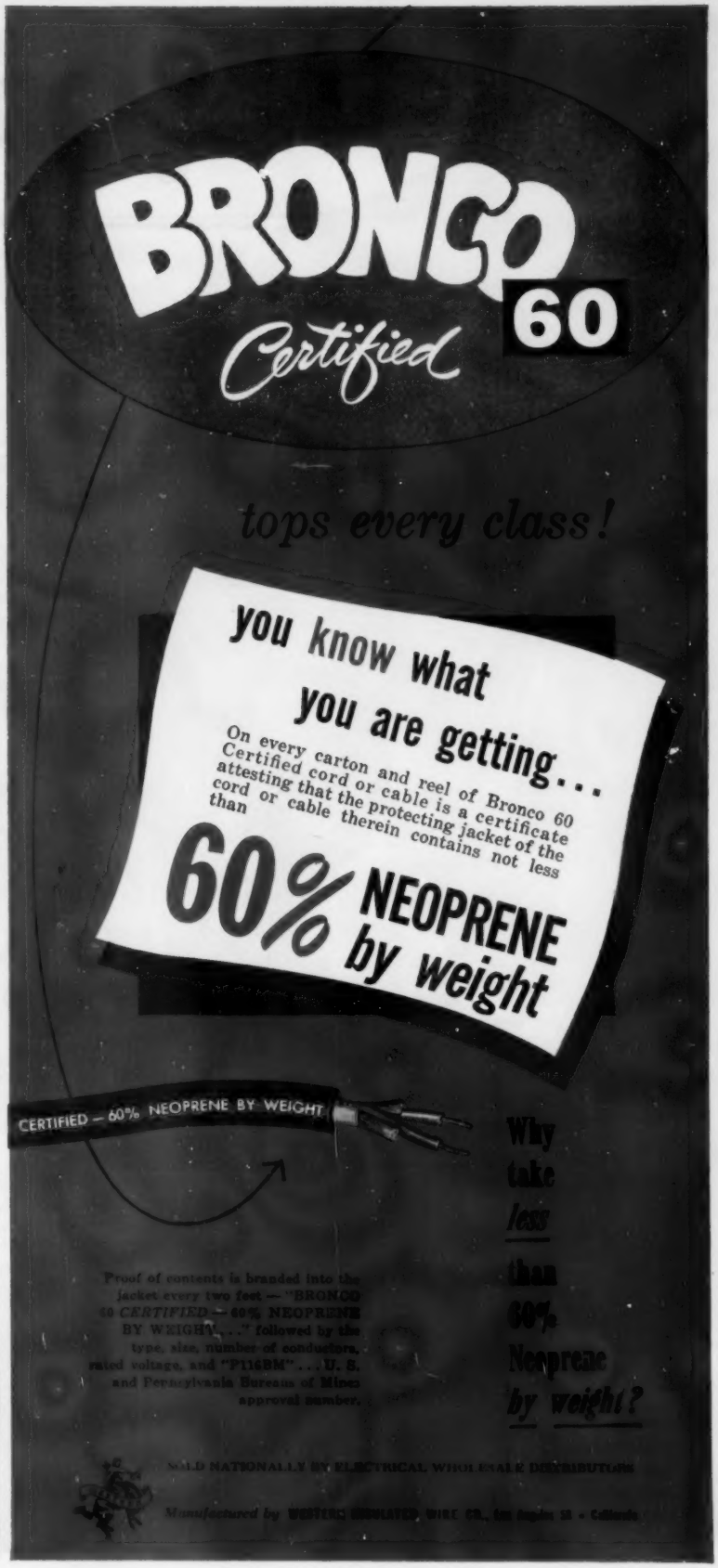
A new model doorless telephone booth that reduces the loudness of outside noise 50%. Model 45 is of triangular configuration designed to be placed against walls, or corners, in multiple installations in a line or as a circular island. It is of all metal construction, with a finish covering thick layers of sound-absorbing material that trap extraneous noises. The user may conduct his conversation in maximum acoustic privacy. For use in noisy locations, such as industry, subway stations, rail and air terminals, stores, hotel lobbies, etc.

Burgess-Manning Company, Libertyville, Ill.

Speed-Grip Chuck (40)

A new speed-grip chuck that grips positively both forward and reverse has been announced as a feature of the new Ridgid 500A pipe and bolt threading machine. Speed-grip uses a new gripping principle. Jaws are closed on work with a light sock of hand wheel and motor power further tightens grip, released when desired by turn of handwheel. All tools can be used separately. Quick-opening Quadra, dual and mono die heads available; also bolt, conduit and special dies. Concealed oil system, capacity ⅛-in. to 2-in. pipe or conduit, ¼-in. to 2-in. bolts.

Ridge Tool Company, Elyria, Ohio


BRONCO 60
Certified
tops every class!
you know what you are getting...
On every carton and reel of Bronco 60 Certified cord or cable is a certificate attesting that the protecting jacket of the cord or cable therein contains not less than
60% NEOPRENE by weight
CERTIFIED — 60% NEOPRENE BY WEIGHT
Why take less than 60% Neoprene by weight?
Proof of contents is branded into the jacket every two feet — "BRONCO 60 CERTIFIED — 60% NEOPRENE BY WEIGHT..." followed by the type, size, number of conductors, rated voltage, and "P116BM"... U. S. and Pennsylvania Bureaus of Mines approval number.
SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS
Manufactured by

Progress is built

Fairbanks-Morse will also continue to supply electric motors in *old* NEMA frame sizes.

. . . brick by brick

The new NEMA Standard for electric motors is a significant sign of progress to all industry—More Power in Less Space.

But progress—to be lasting—must be built brick by brick
For more than a century, Fairbanks-Morse designers have held to the ideal of more performance in less space. They have produced outstanding advancements in the design of diesel engines, pumps, scales, locomotives and the many other products that feature F-M exclusives. Fairbanks-Morse electric motors built on this basic F-M engineering philosophy are continuing assurance of operating economy and efficiency.

Look for the electric motor that stands on this Fairbanks-Morse solid foundation of design progress. It carries the Fairbanks-Morse Seal of Quality.

NEW FAIRBANKS-MORSE GUARDED DRIPPROOF MOTORS

1 Guarded, dripproof construction keeps falling objects and dripping liquids out of motor in any mounting position—maximum motor protection under conditions of wet or dirty operation—indoors or out.

2 Exclusive Fairbanks-Morse feature that provides a virtually indestructible one-piece rotor—homogeneous, free from flaws and gas inclusion for maximum strength and lifetime service.

3 Oversized, precision ball bearings in spacious housings, sealed against grease leakage. Contain ample lubrication for extended periods of rugged service. Convenient flushing and re-lubricating available if desired.

4 F-M exclusive design eliminates hot spots. Cooling outside air is drawn into motor through openings in lower portion of both bearing arms and circulated through cored passages in the frame.

5 New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

FAIRBANKS-MORSE
a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

Service-Master

THE IDEAL ELECTRICAL CONTRACTING AND MAINTENANCE BODY

Here's the body that takes a completely equipped shop to the job, and saves up to 75 minutes per day. Using the latest average service base rate of 6 cents a minute and an average saving of 30 minutes a day . . . Service-Master saves $478.00 worth of time a year. Available in sizes for ½, ¾, 1, and 1½ ton chassis — regardless of age or make. The coupon below will bring complete details, with no obligation to you.

MAKE YOUR PICK-UP TRUCK A SERVICE TRUCK, TOO!

SERVICE-TWINS

for ½ and ¾ ton pick-up trucks

These easy-to-install tool and material compartments are finished in baked-on, medium-dark green enamel. Parts bins are built-in. Doors have slam-action catches, with locks keyed alike. Available with overhead rack.

McCABE-POWERS AUTO BODY CO.
5900 No. Broadway • St. Louis 15, Mo.

Please send me complete details on:
SERVICE-MASTER ☐ SERVICE-TWINS ☐

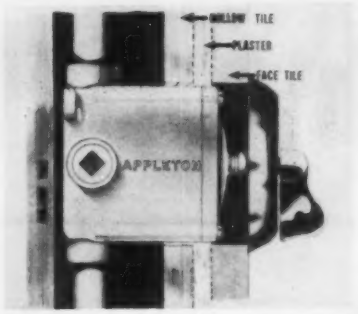
Name_____

Company_____

Address_____

City & State_____

SE



Switches (41)

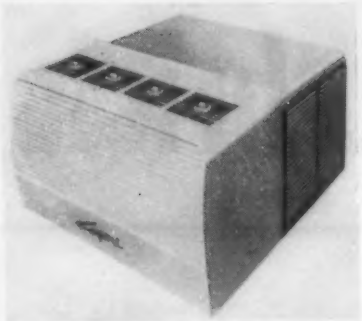
A new "EHS" series of explosion-proof sealed hospital switches for operating rooms. They are easily installed in walls of different plaster or tile thickness, adjusting from $\frac{9}{16}$ inches to $1\frac{13}{16}$ inches maximum. A self-leveling adjustment also compensates for variations up to 5° off wall level. Specified for Class I, Group C and D hazardous locations, switches comprise a switching device which is factory-sealed within the explosion-proof switching enclosure or Unilet. Wire leads are furnished and line wires are spliced in Unilet body. Factory seal eliminates need for sealing fittings. Both single-gang and two-gange switches are available for single-pole and double-pole installations across 15-amp, 1250-volt and 10-amp, 250-volt ac circuits. Four conduit hubs are provided.

Appleton Electric Co., 1701-59 Wellington Ave., Chicago 13, Ill.

Instrument (42)

A new hook-on volt-ammeter with automatic scale changing. Designated AK-5, the pocket-size unit is designed to measure current and voltage quickly and accurately. It has a current range of 5/20/80/350 amperes, embracing the extent of currents normally encountered in industrial and commercial circuits. The five-ampere range permits load checks on fractional-horsepower as well as low-energy control circuits. It also measures ac voltage in three ranges, 150/300/750, without auxiliary equipment. The AK-5 will clamp around any conductor up to two inches in diameter. Its contoured trigger closes and opens hook-on assembly, which is covered with insulation. Unit is shock-resistant and is provided with screw-in voltage leads.

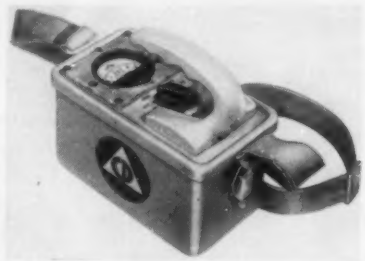
General Electric Company, Schenectady 5, N. Y.



Air Conditioner (43)

New Frigid-Capri window type room air conditioners designed for year 'round living. Available in ½-, ¾- and 1-ton capacities. Equipped with draft free louvres that are individually adjustable to direct flow of air. Special Frigidial control is concealed beneath cabinet lid. Built-in thermostatic control for variable cooling. It cools, heats and dehumidifies. Intake filter is 1 inch thick. Tecumseh compressor hermetically sealed. Totally enclosed motor, lubricated for life. They are U.L. and C.S.A. approved. ¾-ton unit is available in 115 and 230 volts.

Frigid Incorporated, 128-168 Thirty-Second Street, Brooklyn 32, N. Y.



Survey Meter (44)

"Rad-Tek" is a radiological survey instrument approved for use by the Federal Civil Defense Administration. It measures radiation intensities from 0.02 to 50 roentgens per hour (r/hr) and operates on ordinary flashlight and hearing aid batteries capable of giving over 100 hours of operation. "Rad-Tek", bearing the CD emblem painted in yellow, is light in weight, watertight, and the controls are like the thermostat on an electric iron, mounted under the handle in a similar manner.

El-Tronics, Inc., 5th & Noble Sts., Philadelphia, Pa.

Emergency Light (45)

A new emergency light Model CH-25 with a nickel cadmium battery, which is rated with a life expectancy of from 15 to 20 years. It contains two six-inch heads with adjustable No. 4013 sealed beam lamps. Operation of unit is automatic. It has automatic trickle charging

"...simplicity of hanging these fixtures is beyond all expectations"

J. M. Reese
Modern Electric Company

Typical Classroom, Sequoia Jr. High School, Fresno, Calif.

Electrical Contractor Praises California School Installation of Wakefield Grenadiers

J. M. Reese, estimator-engineer of the Modern Electric Company, Fresno, California, writes as follows:

"We are pleased to inform you that much to our surprise the simplicity of hanging these fixtures is beyond all expectations. We have discovered that two men can distribute and hang an average of twenty fixtures a day, or an average of 45 minutes per unit. To quote our foreman, 'Everything fits perfectly and nothing has to be re-worked'.

"At this time we would like to take the opportunity to thank you for suggesting that we use the Wakefield Grenadier on this job. The attractiveness of this fixture as well as the simplicity of hanging will make it a very popular item for our recommendation in the future."

Over and over again, electrical contractors report on swift and trouble-free installations of Wakefield Grenadiers. For complete information write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Limited, London, Ontario.

Home Making Classroom, Sequoia Jr. High School

Art Class Room, Sequoia Jr. High School

QUICK FACTS

- Sequoia Junior High School, Fresno, California.
- 12 classrooms, multi-use room, home economics department, auditorium and Industrial Arts Building.
- Total of 279 two-lamp 96" units mounted on 24" stems.
- Average footcandles maintained: 50.
- Electrical Contractor: Modern Electric Company, Fresno, California.
- Distributor: Graybar Electric Company, Fresno, California.

Wakefield Over-ALL Lighting

WAKEFIELD GEOMETRICS

THE CAVALIER

THE GRENADIER

THE PACEMAKER

THE COMMODORE

THE STAR

THE WAKEFIELD CEILING

You can't beat Black & Decker *Power* for Speeding Jobs and Saving Money!

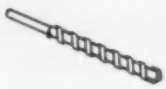
DON'T waste valuable time struggling with old-fashioned hand tools when you have a hole to drill! Switch to Black & Decker power and see how much time (and money) you actually save on every job!

Take the B&D ½" Standard Drill, for example. You just can't beat it for general-purpose use on all your jobs! It drives twist drills, Hole-Saws and wood augers for drilling joists and steel boxes; installing switch boxes, cut-outs and switch boards; cutting through switch and terminal boxes in BX work; deep boring in heavy timber and planking. With carbide-tipped drills, it goes through brick, cement and cinder block walls. And a special right angle attachment makes drilling in tight places a cinch.

See your nearby Black & Decker Distributor for a demonstration. Write for a FREE, detailed catalog to: THE BLACK & DECKER MFG. Co., 617 Pennsylvania Ave., Towson 4, Md.

B&D Right Angle Attachment is perfect for close-quarter work, like reaching out-of-the-way places on joists. Transmits full power; maintains correct spindle speed. Attaches to B&D ½" Standard and larger drills.

B&D Hole-Saws cut clean, round holes *faster*—in wood, steel, plastics, board, alloys. Perfect for cutting through switch and terminal boxes. Fine-tooth and coarse-tooth styles in sizes from ⅝" to 4" diam.; mandrels to fit all electric drills.



B&D Masonry (Carbide-Tipped) Bits go through brick, cement, cinder block and similar materials much faster than a star drill, and the hole size is maintained more accurately. Easily sharpened without reducing cutting diameter.

Get more details about Portable Electric Saws, Hammers and other Black & Decker Tools from McGraw-Hill's Electrical Catalog.

LEADING DISTRIBUTORS EVERYWHERE

B&D Black & Decker PORTABLE ELECTRIC TOOLS

with provisions for switching to a high rate charge, a test switch and voltmeter for testing battery, and is for use on ac, 115 volts, 60 cycles. Battery is nickel cadmium, 5 cells, 6 volts, 30-ampere capacity.

Dual-Lite Co., 186 Front St., Bridgeport 6, Conn.

Meter (46)

One man instead of two can trace electrical lines and cable circuits with the Trace-O-Meter. Electrician slips a tagged jumper to each circuit at the remote end of the line; then he touches the wires at the other end of the line with the probe. As each circuit is touched, meter indicates correct number as tagged by jumper. Nine wires can be identified. If there are more lines or circuits, they can be identified and marked in groups of nine. Instrument has a control to preset meter in relation to electrical loss through the lines.

Jackson Electrical Instrument Co., 16-34 S. Patterson Blvd., Dayton 2, Ohio

Floodlight (47)

A new floodlight of aluminum construction, designated L-66, was designed for work and recreational activities in home, farm, and industrial areas.

Equipped with ribbed trunnion bracket that permits 360° vertical or horizontal rotation, the floodlight utilizes a 200-watt general service lamp that throws a 946-candlepower beam. It weighs four pounds and is provided with a large aluminum base suitable for portable use or permanent mounting. It is equipped with a 6-foot neoprene-jacketed cord and molded plug. Other features include a heat- and weather-resistant glass lens, snap-ring clamping band for lamp access, porcelain-based socket, and knockouts in base to permit mounting on 3½- and 4-inch outlet boxes.

General Electric Co., Schenectady 5, N. Y.

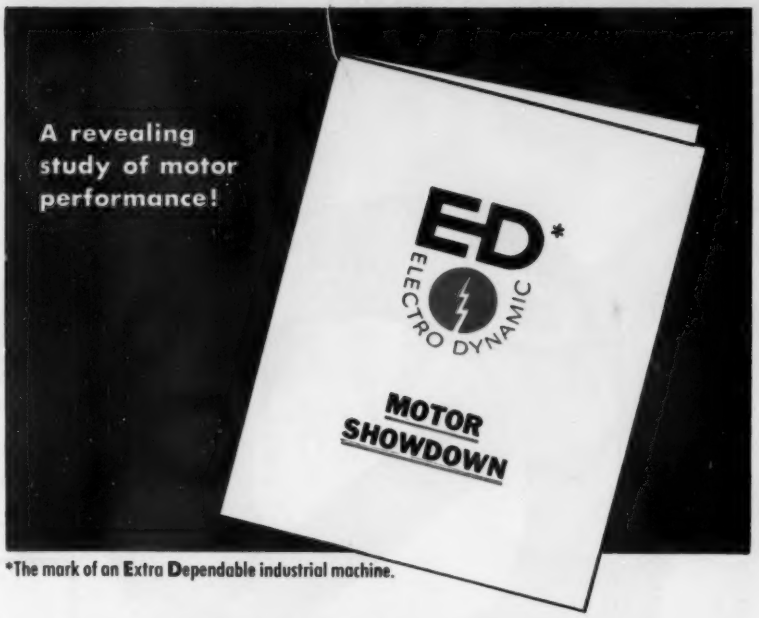
Light Fixture **(48)**

A new light fixture, known as Dekorative Light, is made of non-rusting Alumalloy, is available in aluminum or steel grey finish and will take 100- or 150-watt lamp. There are three styles—bracket, ceiling and pendant. Ceiling type fixture mounts on outlet boxes, or on Killark VG series fittings. Bracket style mounts on outlet boxes and VOLP plates. Globes are available in clear and frosted types. It is protected from all kinds of weather by a neoprene gasket seal. For use in schools, theatres, public buildings, garages, hallways, stairways, walkways, driveways, loading docks, etc.

Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

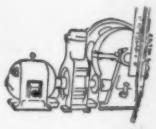
Electric Plant **(49)**

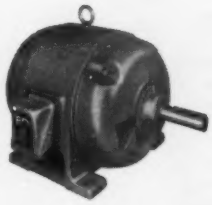
A new 5000-watt ac air-cooled light weight electric plant, the 5RM61, is designed for installations where a liquid-cooled unit is not practical. Powered by



*The mark of an Extra Dependable industrial machine.

THIS CANDID REPORT UPSETS MANY IDEAS ON MOTOR SELECTION FOR INDUSTRIAL MACHINES





1 to 250 hp. AC and DC. Standard or special purpose. N.E.M.A. standards.

The results of comparative performance tests* on production line models of different makes of electric motors are reported concisely in a new booklet entitled **"MOTOR SHOWDOWN"**. The facts revealed are of real importance to anyone concerned with motor selection, because the makes of motors tested power over 90% of the electrically operated machinery in *your* industry. Mail the coupon below for your copy.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern university

ELECTRO Extra DYNAMIC dependable motors

ELECTRO DYNAMIC • ***Division of General Dynamics Corporation***
171 Avenue A, Bayonne, New Jersey

Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

NAME_____

COMPANY_____

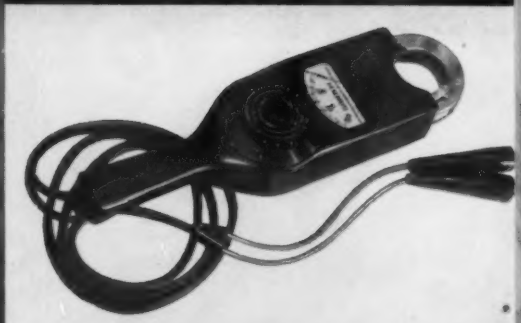
ADDRESS_____

EASY RANGE SELECTOR automatically changes scales. Screw-in voltage leads cannot be pulled out accidentally, giving more protection to operator during actual tests.

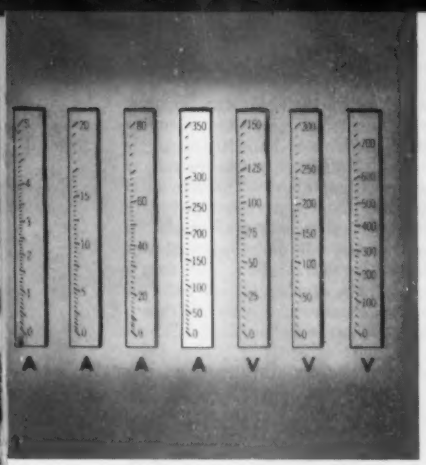
ACTUAL SIZE

The new G-E AK-5 hook-on fits readily into your pocket and is very handy for all your testing and maintenance requirements. You can make electrical checks of equipment without interruption of operations. Greater versatility is attained with current ranges of 5/20/80/350, and voltage ranges of 150/300/750.

HERE ARE TWO MORE

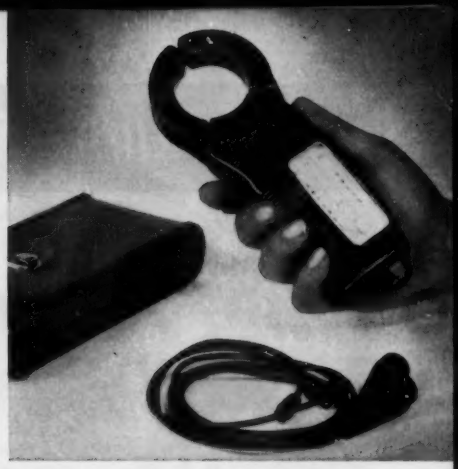


EASY HOOK-ON INSTALLATION and fingertip range selection of the G-E wattmeter quickly determines readings in balanced 3-phase circuits.



ONLY ONE SCALE SHOWS, cutting down possibilities of reading errors. You have a wide range selection of seven scales with current marked red and volts black.

HOOK IS EASILY OPENED by squeezing contoured trigger. Insulation covering on hook reduces the possibility of grounding or short circuiting, giving added safety to operator.



NEW G-E HOOK-ON is shock resistant and compact for pocket-size. Complete set has sturdy case, and 3½-foot leads, with insulated alligator clips.

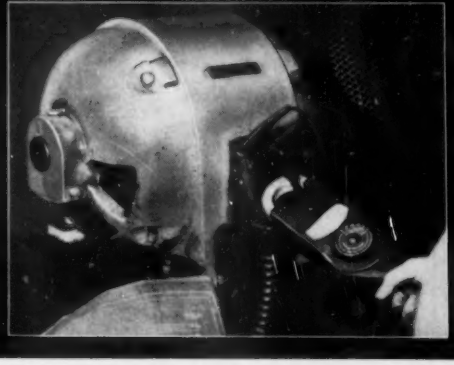
General Electric Designs . . .

New Pocket-sized Volt-ammeter

. . . with Automatic Scale Changing

The new General Electric hook-on volt-ammeter is first in its field to feature automatic range and scale changing, which eliminates the possibility of reading the wrong scale. Designed to show only one scale at a time, the instrument has a wide range of seven scales to cover almost all of your testing and maintenance requirements. Engineers, contractors, electricians, maintenance and servicemen will find this new G-E pocket-sized hook-on ideal for balancing circuits, estimating new or revised distribution circuits, tracing faults and grounds or diagnosing operating troubles without shutting down equipment.

VERSATILE G-E HOOK-ON INSTRUMENTS FOR TESTING AND MEASURING



SECTION A602-286
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK

Please send me a copy of the bulletin(s) checked below:

☐ GEC-901 AK Hook-on Indicators
☐ GEA-6104 CF-7 Hook-on Recorder

Name.....

Company.....

Street.....

City.....Zone....State.....

NO CALCULATIONS NECESSARY with this power-factor indicator. Accurate to within 0.05 PF, the AK-3 gives readings on any balanced 3-phase circuit.

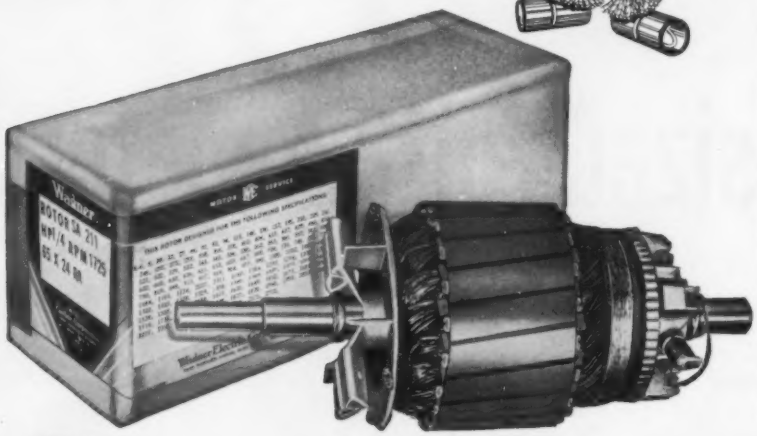
ONE USE OF ALL hook-on instruments is to locate overheated motors before trouble starts. You save valuable time with these simplified instruments, featuring easy-to-read scales.

COMPLETE INFORMATION is available on the G-E hook-on line in the free bulletins offered above. Clip the coupon and mail your request now.

GENERAL ELECTRIC

GENUINE JOE SAYS:

here's a way to save *hours* of rewinding time...



YES, you *can* save time—and money, too—by replacing fractional hp motor armatures with Wagner Standard Rotors. They actually cost less than a rewinding job. There's no guesswork involved in choosing the right replacement rotor—a "tell all" label on the carton, used with K and M "spec" lists, assures the right unit every time. Special shafts present no problems. It's simple to remove the shaft from the standard rotor and replace it with the special.

P.S. **It's wise, too, to carry a stock of Wagner Replacement Motors.**

They come in handy for emergency use when your customer needs immediate service and they're easy to sell to replace motors "too far gone" for repairs.

P.P.S. **Be sure to get the *NEW* Electrical Service Catalog MU-40.**

It's just off the press. Every repair shop needs this valuable help. It's yours for the asking.

WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U. S. A.

Wagner Electric Corporation EST 1891

MOTORS · BEARINGS · STANDARD ROTORS
BRUSHES · CAPACITORS · COMMUTATORS

650 AUTHORIZED SERVICE STATIONS OR PARTS DISTRIBUTORS

MS54-3

the K660 engine—a 2-cylinder opposed, 4-cycle air-cooled engine—the plant is available in 115-volt or 115/230-volt single phase ac models. Either manual or remote starting is available in all models. Remote starting models are equipped with automatic chokes. Cooling of engine is accomplished by a large capacity blower and housing with baffles. Plant is equipped with a muffler, an oil bath air cleaner and oil pressure gauge. Dimensions are 23½-in. wide by 28$\frac{11}{16}$-in. high by 32⅜-in. long.

Kohler Co., Kohler, Wis.

Cable Reel (50)

Cable reel, No. 480, is designed for handling of heavy flexible cable, wire and other materials. The all-steel tubular coil supports are locked in position by a single handle. Open construction permits tying of coil before removal by collapsing of reel. Reel has oilless bearings, all-welded steel construction and large capacity with 26-in. I. D. coil. Support members for coil are tubular semi-circles 8½-in. in diameter. Reel may be vertically mounted or with No. 500 stand for portable or fixed lag-bolt installation.

Hykon Mfg. Co., Alliance, Ohio

Fluorescent Lamp (51)

A new rapid-start fluorescent lamp produces higher light output and is expected to find wide use in industrial, commercial, office and school applications. It operates efficiently at low atmospheric temperatures and therefore can be used out-of-doors. Available in the 96-inch length, 1½ inches in diameter. A 72-inch lamp will be available later. Lamp features a new lamp base, which incorporates two recessed contacts in a single element.

General Electric's Lamp Division, Nela Park, Cleveland 12, Ohio.

Wall Heater (52)

A new electric heater which can be mounted on concrete, brick or stone walls. Known as the Electromode surface

mounted wall heater, it was developed for use in basement game room, laundry, garage, office, or any room with hard surface walls. Clean, fan-forced heat is circulated at floor level. Finish is silver grey hammertone. It is available in 1500-, 2000-, 3000-, and 4000-watt capacities, in both automatic and non-automatic models. Three "T" slots are provided on back of heater for mounting. Provision is also made for service connections. Heater is 21-in. high, 17-in. wide, and extends 5½-in. from wall.
Electromode Corp., Rochester 3, N. Y.

Clamp (53)

New BTC straight line strain clamp for use on ACSR and all-aluminum conductors. Primarily designed for use on distribution, light transmission and substation networks, clamp has a bore size range of 0.46–0.90 in., holding all conductors within its bore size range including copper, all-aluminum, 18 x 1 and other ACSR conductors. Clamp can be supplied with either a drop-forged aluminum or steel body and drop-forged steel keeper. Use of copper or aluminum liners is recommended in steel clamps.
Brewer-Titchener Corp., Cortland, N. Y.

Electric Heater (54)

A new low-priced electric bathroom heater provides heat both by radiation of infrared rays directly into room and by circulation of warm air throughout room. A flip of the built-in toggle switch provides immediate heat. Both stainless steel and chromium-plated grilles are available. Heaters are rated at either 1250 or 1500 watts, and operate on 115 volts ac. Grille dimensions are 20 inches by 10¾ inches. Wall opening is 17¾ inches by 8¼ inches.
Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

Product Briefs

(55) The Lufkin Rule Company, Saginaw, Mich., has announced a new Hi-Line non-metallic woven measuring **tape**. . . . (56) General Cement Manufacturing Co., Rockford, Ill., has developed a two-in-one electrical contact **cleaner** and **lubricant** called "Spra-Kleen". . . . (57) A mobile **radio system** designed for operation in the UHF 450-470 MC band has been announced by Allen B. DuMont Laboratories, Inc., Clifton, N. J. . . . (58) Hays Manufacturing Co., Erie, Pa., has developed a new solenoid **valve** which gives automatic flow control.

(59) Airmatic Valve, Inc., Cleveland, Ohio, has introduced a new hand-and-foot operated four-way **valve** with built-in, full-capacity, flow-control meters of the Venturi type. The basic valve is also available for remote pilot operation. . . . (60) A pocket-size **tachometer**, known as the Fowler Vibra-Tak, has been announced by Verdell Instrument Sales Co., Burbank, Calif.

BLUE METAL COATING

is an improved rust preventative that provides lasting protection for metal surfaces. With an application of No. 564 Blue Metal Coating you can safely ship or store your units without fear of corrosion. It can be used on castings, shafts, motor armature laminations and any exposed metal surfaces.

No. 564 can be applied by brushing, spraying or dipping. It air drys in 15 minutes. The film produced is thin enough to permit using with close air gap tolerances.

Write today for full information and a sample of No. 564 Blue Metal Coating, and test it on your own equipment.

Insulating Varnishes

GEORGE C. BORTHIG CO., INC.

EAST RUTHERFORD 1, NEW JERSEY, P. O. Box 115

New
TOLEDO
PIPE CUTTER
for Cleaner Smoother Cut-offs!

Heavy Duty Wheel and Roller

★ Positive clean-cutting action.
★ Hooks on pipe easily . . . tracks perfectly . . . sturdy malleable frame formed to fit the hand and guaranteed warp-proof.
★ High alloy steel cutter wheels leave practically no burr.
★ Rollers in hook provide a square base when starting tool on pipe. Cuts ⅛" to 2" pipe . . . with speed and ease! Order through your supply house. Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER!
TOLEDO
POWER PIPE MACHINES
POWER DRIVES
PIPE TOOLS

(61) Utica Drop Forge and Tool Corp., Utica, N. Y., has announced new cam action, high leverage **cutting pliers**, which cut up to ¼-in. hardened steel drill rod. . . . (62) New changeable carbon tip electric spot **solderer** gives concentrated heat instantly, on low voltage. It is manufactured by Newage International, Inc., New York, N. Y. . . . (63) Dreier Brothers, Inc., Chicago, Ill., has developed a new **hack saw**, called "Double Hac-Saw", which holds two 12-in. blades.

(64) Crown Controls Company, Inc., New Bremen, Ohio, has announced a new combination **hacksaw and drill**, called Saw-Drill. . . . (65) Industrial boring tools with the "Magic Circle" bore holes from ⅝-in. to 2-9/10-in. diameter with ¼-in. or ½-in. **electric drill**. They are manufactured by Time Saver Tools, Inc., Mundelein, Ill. . . . (66) A new line of power system **analyzers** has been announced by the I-T-E Circuit Breaker Co., Philadelphia 30, Pa.

(67) A new 9- x 7-in. heavy-duty **sander-grinder** for continuous production service has been put on the market by The Black & Decker Mfg. Co., Towson, Md. . . . (68) New earth auger **pilot bits**, The Pengo combination fishtail-hardpan pilot and the Pengo cone pilot, specially designed for use in frozen ground, are now in production by Petersen Engineering Co., Santa Clara, Calif. . . . (69) Development of new, improved C-7½ Christmas **lamps**, available in a variety of colors, have been announced by General Electric's Lamp Division, Cleveland, Ohio.

(70) A new high current **test unit** with built-in ammeter and electronically actuated timer has been announced by Multi-Amp Corporation, Newark, N. J. . . . (71) A new series of precision midget **thermostats**, called midget Thermoswitch, has been developed by Fenwal Incorporated, Ashland, Mass. . . . (72) A portable **Strob-Light**, designed for checking speeds of rotating equipment and calibrating tachometric devices has been announced by the George L. Nankervis Company, Detroit, Mich.

(73) Greibach Insruments Corp., Metuchen, N. J., has developed a new **meter movement** which withstands mechanical shocks of 500 g's on all three axes and electrical overloads in excess of 100,000%. . . . (74) Automatic electric **melting pots** that heat and hold soft metals at the proper temperature are available from Westinghouse Electric Corporation, Pittsburgh, Pa. . . . (75) A Kelon-T **tape** combining toughness, excellent electric proprieties and resistance to abrasion and corrosive chemicals at high and low temperatures is available from W. S. Shamban & Co., Los Angeles, Calif.

(76) Hitemp Wires Inc., Mineola, L. I., has announced a glass-braided **lead wire**, known as Tempelad. . . . (77) A new spot **concrete insert**, designed for quick suspension of piping, electrical conduit, heating and ventilating ducts, etc., has been announced by the Unistrut Products Company, Chicago, Ill.

It's smart to specify Efcor
ELECTRICAL FITTINGS
because they are:
★ Made of Malleable Iron and Steel
★ Engineered for improved performance
★ A complete line of fittings for every type of job

UL

Efcor MAKES "THE BEST CONNECTIONS"
SOLD THROUGH ELECTRICAL WHOLESALERS ONLY
Efcor
ELECTRICAL FITTINGS CORP.
Dept. C-22
Woodside 77, New York

Each Spang Representative and his sales personnel throughout the nation now carry this new type conduit display box to present top-quality Spang Conduit.

SPANG® presents

the Case of the Quality Conduit

Here they are . . . Spang's "Big Three" . . . SPANGLEAM EMT, Spang Black and Spang Galvanized (Hot Dipped)! The top-quality conduit designed to help you do a quality job . . . and to give years and years of quality service in every type installation!

Why is Spang so proud of its conduit? Here's why—

QUALITY-MANUFACTURED . . . Only the highest quality steel is selected for Spang Conduit, and it is formed under exact heat conditions with close metallurgical controls rigidly adhered to.

QUALITY-TESTED . . . Spang Conduit is constantly inspected throughout manufacture, and every piece of conduit is *doubly* tested and inspected before delivery.

. . . FOR QUALITY INSTALLATIONS. Spang Conduit is easier to cut, thread, bend and weld, saving you valuable time and money on all your conduit installations.

Take your choice of the "Big Three" . . . Spang Black, Spang Galvanized (Hot Dipped) or SPANGLEAM EMT . . . but be sure to specify Spang. Your Spang Distributor carries the complete Spang Conduit line.

SPANG® CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

Catalogs, Bulletins and Engineering Data

(78) MACHINE AND BENCH LIGHTS; featuring cast aluminum reflectors. 4-page Bulletin 126-54. Steber Mfg. Co.

(79) WIRING DEVICES made of a Neoprene compound are impervious to oil, grease and most chemicals. 8-page folder. Daniel Woodhead Co.

(80) CONTACTS and contact assemblies; characteristics of various materials and selection guide of standard design forms. 59 pages. P. R. Mallory & Co., Inc.

(81) FANS; new 1954 catalog of residential and industrial fans. 12 pages. Frigid, Inc.

(82) SOCKETS, brass and phenolic; Bulletin S-54 illustrates three new units. McGill Mfg. Co.

(83) SPLICE CAPS of Nylon and their multi-purpose crimping tool are described in a 4-page folder. Buck Electrical Mfg. Co.

(84) AUTOMATIC TRANSFER SWITCHES, a new publication giving factors governing selection of these devices; diagrams and descriptions of hookups. Bulletin 502, 4 pages. Automatic Switch Co.

(85) V-BELTS; how to figure a v-belt drive; reference tables and description of the grommet type belt. 8-page Bulletin 2170. B. F. Goodrich, Industrial Products Div.

(86) BUILDING WIRES; new pocket size catalog gives comprehensive data including ratings, dimensions and weights. Chart lists permissible installations for each type of wire. 32 pages. Triangle Conduit and Cable Co.

(87) FLUORESCENT LAMP for desk or drafting table. 4-page brochure has sizes and prices. Swing-O-Lite, Inc.

(88) HEAT CONTROLS, their application and installation. GEA-6118, 12 pages. General Electric Co.

(89) FARM LIGHTING booklet offers suggestions for special applications of light to increase production and efficiency; also lighting for the farm home and outbuildings. 12 pages. I673. Sylvania Electric Products, Inc.

(90) STANDBY ELECTRIC PLANTS and controls with illustrations and diagrams of typical installations. 12-page bulletin T-011. D. W. Onan & Sons Inc.

(91) TOGGLE SWITCHES and assemblies to control from 1 to 24 circuits; various ratings and designs. 12-page Catalog 73a. Micro Switch.

(92) RATCHET-LEVER HOISTS including both roller and coil-chain models in capacities ranging from ¾ to 15 tons. 8-page Bulletin SP. Coffing Hoist Co.

(93) RECESSED INCANDESCENT FIXTURES are screwless, self-locking and detachable; sizes from 60 to 150 watts. Markel Electric Products, Inc.

(94) SELENIUM RECTIFIERS up to 260-volt input and 30 amps are described in a 24-page catalog giving voltage curves, circuitry and applications. Bulletin 177. Radio Receptor Co.

(95) METAL POLE units, known as "Servisafe", designed to permit ground-level servicing of luminaires; single- and double-arm models available. Catalog PB-53. 32 pages. Thompson Electric Co.

(96) DYNAMOMETERS for measuring motors of 2 hp or less. 4-page brochure gives techniques and applications. Smaller unit tests motors under 1/10 hp. Mission-Western Engineers, Inc.

(97) MERCURY PLUNGER RELAYS for heavy-duty plant control and original equipment applications in single, double and three pole units; rated for 60 amps at 115 volts and 35 amps at 230 volts ac. Ebert Electronics Co.

(98) TRANSFER VOLT-AMMETER; use, features, and components are described in 4-page bulletin. Charles Engelhard, Inc.

(99) CIRCUIT BREAKERS; entitled "4 Ways to Improve a Masterpiece", this bulletin illustrates latest improvements to the Stab-lok breaker. 8 pages. Federal Electric Products Co.

(100) FLUORESCENT BALLAST guide gives dimensions, ratings and prices for complete G-E line, GEC-983B, 8 pages. General Electric Co.

(101) CONNECTORS for liquid-tight flexible conduit, available in four types; sizes and prices. 4-page sheet TST-354. Appleton Electric Co.

(102) BEARING evaluation chart lists 17 basic performance and application elements to be considered in selecting the proper bearings, indicates the right one for the job. Thomson Industries, Inc.

(103) SELENIUM CHARGERS for use with motorized electric hand trucks; available for either lead or nickel-alkaline type batteries. 4-page Bulletin P-1333. Yale and Towne Mfg. Co.

(104) LIGHTING SHOPPING CENTERS; a profusely illustrated handbook gives 64 layouts, 110 pictures of store lighting, including incandescent, fluorescent, and combination installations. Separate sections on exterior lighting and fundamentals. 80 pages. Holophane Co., Inc.

(105) FIRST AID KITS for industrial usage. 6-page folder describes the 70 different units which may be included in a "custom designed" kit. Available in weatherproof, dust proof containers. E. D. Bullard Co.

(106) WOVEN ELECTRIC HEATERS are described in 4-page folder F-1548 giving typical uses and application data for this new versatile heat source. Pre-Fab Heater Co.

(107) FLUORESCENT LAMPS for commercial installation; 4-page bulletin illustrates suggested locations for using this peach-colored, guaranteed tube. Form 1-160. Lustra Corp. of America.

(108) THERMISTORS, a device for detecting and compensating temperatures and for providing time delay and surge control in electrical equipment; applications and technical data. Manual TH-13, 52 pages. Carboloy Dept., General Electric Co.

(109) AIR CLEANER for residential use works on the electrostatic principle. Application and required service connections are described. Home Precipitron Bulletin, 4 pages. Westinghouse Electric Corp., Air Conditioning Div.

(110) CONTROL SWITCHES: automatic cycling and single stroke controls; revolution counting device for ready-mixed trucks; high temperature basic switch; environment-proof switch assemblies; rotary selector switch assemblies; and splash-proof switches. 6 data sheets. Micro Switch.

(111) FAR-INFRARED RADIATION for high speed drying and curing of synthetic textile finishes; 22-page folder also illustrates the advantages of this type of heater in industrial processing. "Textile Report". E. L. Weigand Co.

(112) ASYMMETRIC REFLECTORS; 12-page bulletin B describes advantages of various types of assemblies. Pittsburgh Reflector Co.

(113) MODERNIZATION for industrial and commercial buildings; the necessity and the advantages are described in two booklets which also give basic electrical data. B-6133, 16 pages (Industrial) and B-6151, 22 pages (Commercial). Westinghouse Electric Corp.

all these specialists
will help you get business

Here is a top talent team, a team of specialists. They are your own local people.

Their job is to help contractors *like yourself* on any problem concerning electrical supplies and equipment. For instance, a rewiring job . . . or a technical application of motors and control equipment . . . or a lighting installation. It may be a simple problem or one as complex as you can imagine. It may require advice and counsel about breaking production "bottlenecks."

These men are attached to your own local GESCO warehouse. They augment the service offered through GESCO . . . complete stocks, leading makes, fast deliveries.

The man who regularly contacts you from GESCO is himself well-equipped to serve you. He knows inventory control and sales promotion. He is experienced in the tough problems you bump into day by day. *And* he is supplemented by this top talent team.

To aid in meeting your problem in electrical supplies and equipment, there is help waiting for you at the local GESCO office!

GENERAL ELECTRIC SUPPLY COMPANY

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

ON THE NEXT PAGES, SOME PRODUCTS SUPPLIED BY GESCO's FAST DELIVERY . . .

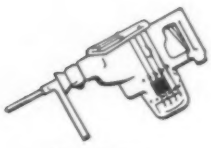
when you must

CUT COSTS

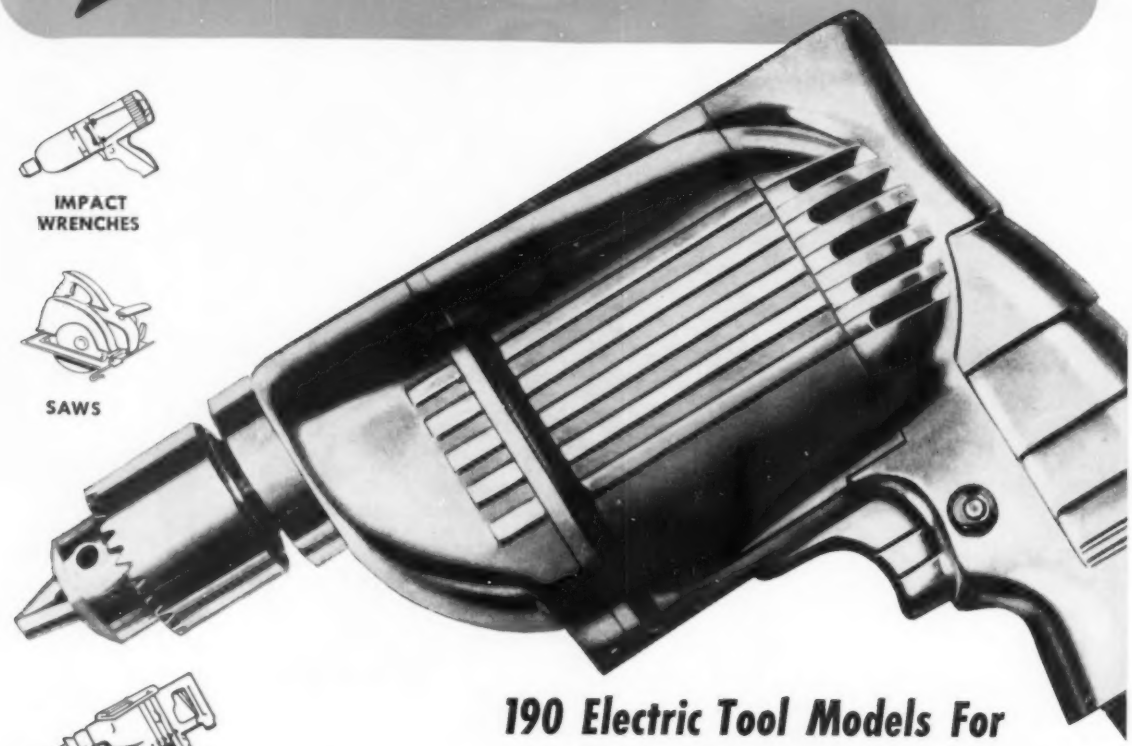
Thor POWER TOOLS ARE THE ANSWER!

IMPACT WRENCHES

SAWS



HAMMERS



190 Electric Tool Models For Every Production, Maintenance and Service Requirement

For quick and drastic cuts in operating expenses, equip your men with POWER TOOLS. Specify THOR for the quality that pays double dividends in extra long trouble-free service. Stocked by your supply distributor. Thor Power Tool Company, Aurora, Ill.

- ELIMINATE COSTLY HANDWORK
- INVEST IN QUALITY TOOLS

Thor TOOLS

WORLD'S BEST BELL?

No doubt about Adaptabel being best by a noise! Size for size, its resonant ring is up to 140% louder than any other bell—and completely free of mechanical clatter!

But Adaptabel's claim to perfection doesn't rely on ringing abilities alone! Design-wise, no moving contacts or springs — together with automatic compensation for plunger wear — means literally *years* of dependability and trouble-free performance! Adjustments are rarely needed.

Ease of installation? Look at the accompanying diagram. Could anything be simpler — more foolproof? Universal mounting plate is designed to fit *any* outlet box with single gang opening!

Adaptabels are available in 4, 6, 10 inch sizes —your choice depending upon the noise level to be overcome. All-metal die cast housings . . . complete range of accessories include a substitute slotted gong where muting is required — full cast grids for areas where gong may be subjected to unusual impact — handsome recessed mountings where flush mounting is a factor — outside weatherproof mountings that are absolutely impervious to the elements!

You can *see* why Edwards Adaptabel* is the most popular heavy-duty ringing unit on the market today! Write Dept. EQ-56, Edwards Company, Inc., Norwalk, Conn.

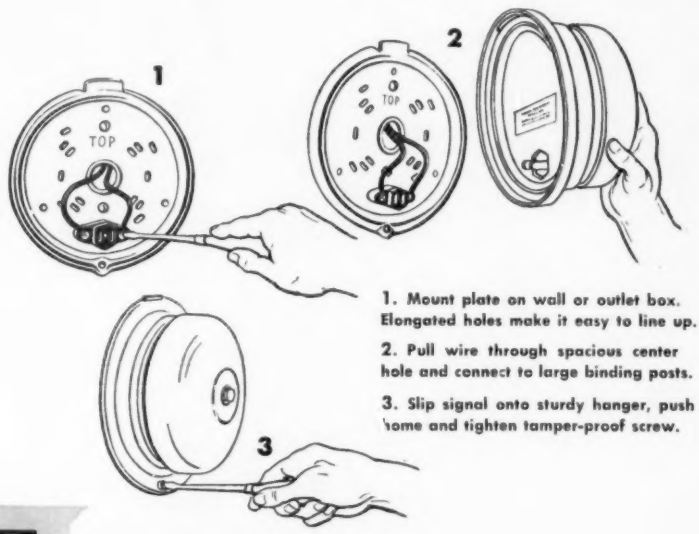
**Listed by Underwriters' Laboratories.*

LOUDNESS FACTOR

Edwards No. 340 AC Adaptabel

size	decibels*	loudness units
4 inch	77	13,500
6 inch	83	21,400
10 inch	89	35,000

**at ten feet*



1. Mount plate on wall or outlet box. Elongated holes make it easy to line up.

2. Pull wire through spacious center hole and connect to large binding posts.

3. Slip signal onto sturdy hanger, push home and tighten tamper-proof screw.

See you at the NAED Convention— Booth 515! June 6-10th.

EDWARDS

World's most reliable time, communication and protection products

Specify EVEREADY BRAND for long life, low operating cost, dependability

"EVEREADY" RR AND INDUSTRIAL DRY CELL No. 6

Specially designed to meet a wide range of service conditions, from very heavy to very light drains.

"EVEREADY" No. 409 LANTERN BATTERY

Gives dependability and long life. Designed to fit many popular types of hand lanterns.

"EVEREADY" "COLUMBIA" "GRAY LABEL" TELEPHONE CELL No. 6

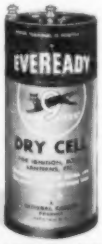
Extraordinarily long life . . . the most widely-used telephone dry cell in the world!

"EVEREADY" No. 1050 INDUSTRIAL FLASHLIGHT BATTERY

Delivers twice the usable white light of any previous "Eveready" flashlight battery. Specially designed for heavy-duty use.

"EVEREADY" No. 950 BATTERY

Gives you the ideal balance of long shelf-life and service-life for all applications, except extreme heavy-duty uses where the "Eveready" No. 1050 battery is recommended.

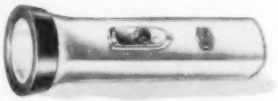


"EVEREADY" "IGNITOR" DRY CELL No. 6

Outstanding recuperative power makes this battery the finest obtainable for ignition, radio, bells, buzzers, electric games, toys, lanterns, etc.

"EVEREADY" No. 1251 INDUSTRIAL FLASHLIGHT

Ruggedly-built case is resistant to shock, water, oils, greases, gasoline, alcohol and acids. Switch is easily removed and replaced by hand. Ring hanger in bottom cap.

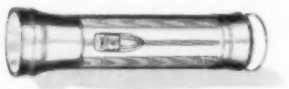


"EVEREADY" No. 7251P FLASHLIGHT

Unbreakable, polyethylene lens-guard glows with high-visibility red light for added safety. Cushions shocks, protects head.

"EVEREADY" No. 1259 INDUSTRIAL FLASHLIGHT (APPROVED SAFETY TYPE)

Approved by the U. S. Bureau of Mines and listed by Underwriters Laboratories, Inc. for use in explosive, gaseous atmospheres. Ring hanger and spare bulb in bottom cap.



"EVEREADY" No. 8251 FLASHLIGHT

Automatic spotlight with removable bottom cap and ring hanger. Finished in durable chrome plate.

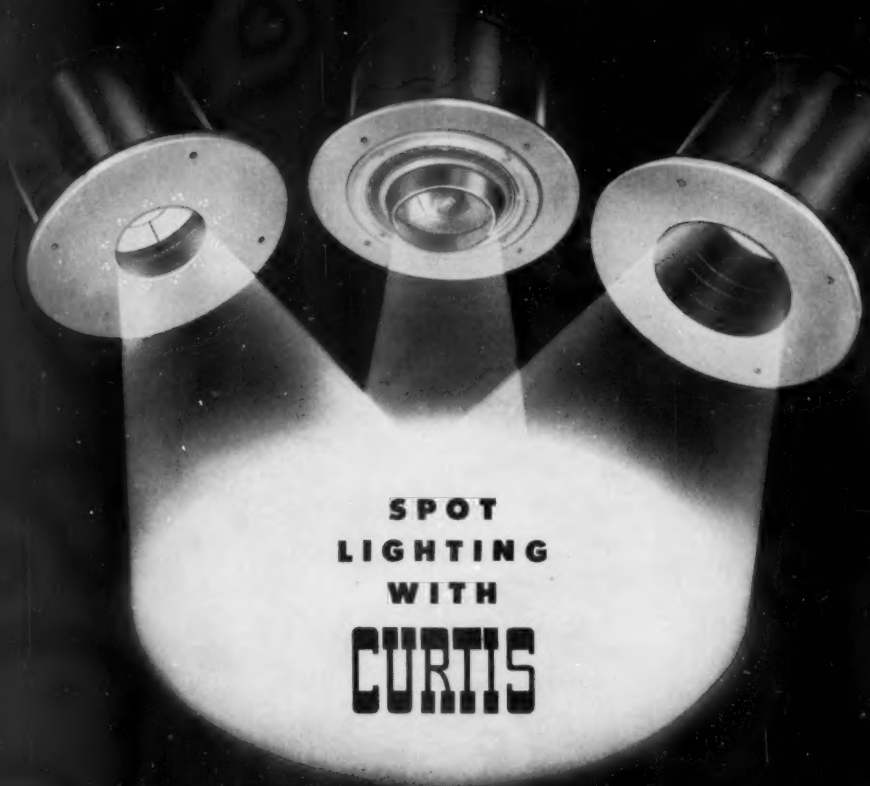
The terms "Eveready", "Ignitor", "Columbia", "Gray Label", "Nine Lives" and the Cat Symbol are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation • 30 East 42nd Street, New York 17, N.Y.

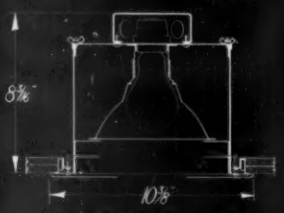
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA: Union Carbide Canada Limited, Toronto



SPOT LIGHTING WITH CURTIS

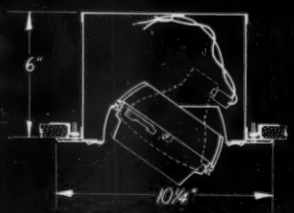
"VARI-SPOT"



CATALOG No. 2246

Curtis "Vari-Spot" is a shallow recessed downlight, utilizing one 100-watt inside frosted incandescent lamp. It is designed for use in residential and commercial interiors. An adjustable Alzak aluminum reflector permits the diameter of the circle of light to be controlled and changed as desired. Decorative holes in the finishing ring provide an attractive light pattern at the ceiling.

"PUNCHY"

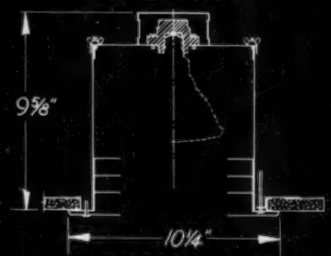


CATALOG No. 2240

Curtis "Punchy", is a shallow recessed adjustable downlight utilizing one PAR-38, Side Prong 150-watt projector spot or flood lamp. It is designed to provide punch lighting for counters, displays, show windows and other areas in store interiors.

"Punchy" features an exclusive aluminum gimbal ring which permits adjustment of the lamp to any angle 0° to 35° from the vertical, and 0° to 360° horizontal.

"SPOTTY"



CATALOG No. 2244

Curtis "Spotty" is a shallow recessed fixed downlight utilizing either one PAR-38 or R-40 screw base 150-watt spot or flood lamp. It has wide application for accent, supplementary and general lighting.

Three horizontal steel baffles, an integral part of each unit, are designed and positioned to provide an exceptionally low-brightness incandescent unit at normal viewing angles.

WRITE FOR FREE DESCRIPTIVE LITERATURE

Curtis Lighting, Inc., 6135 W. 65th Street, Chicago 38, Illinois

it's GARCY by unanimous agreement

GARCY VISUALIER
Two-lamp and four-lamp units in 4 ft. and 8 ft. lengths for standard, rapid start or slimline lamps.

Take all the people who normally have a voice in the selection of lighting fixtures. Seat 'em around a conference table, and you can quickly get them to agree on Garcy.

The reason is that Garcy, by design, looks out for everyone's interest. Architects and designers like Garcy's clean styling and impressive appearance. Lighting engineers approve the high efficiency and low surface brightness which is combined, in the Visualier pictured above, with 45° x 45° shielding.

The exclusive one-piece shielding body is a favored feature with everyone. The complete louver, together with side panels, is formed as a single metal stamping . . . for great inherent strength, no rusting of welded parts, no loosening due to vibration.

For the electrical contractor, the one-piece shielding body is a real boon. With fewer parts to unwrap, carry up ladders and assemble, it saves many installation man-hours and dollars. Maintenance people are equally enthusiastic about the one-piece shielding body. Since it embodies 80% of the fixture's reflective surfaces, cleaning is fast and thorough. The shielding body may be cleaned by merely immersing it in a drum of detergent, leaving only the surface of the chassis to be cleaned by hand.

With Garcy it's "Quality . . . by design." Send for Catalog L-110.

GARCY *Quality by Design*

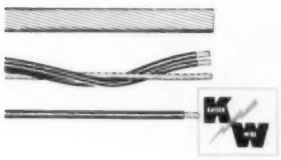
GARDEN CITY PLATING & MFG. CO., 1760 N. Ashland Ave., Chicago 22, Ill.
In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto

You make big savings with Kaiser Aluminum conductor ... available through your nearby Gesco House of Service

YOU CAN SAVE thousands of dollars a year by converting from copper to Kaiser Aluminum covered or bare conductor—available from your nearby GESCO House of Service. Look at *your* savings in the price box below!

Because of big savings like these, many communities all over the country are *standardizing* on aluminum conductor.

Let Kaiser Aluminum help your utility convert to aluminum easily, efficiently, economically. Complete field, engineering and laboratory services available through your local GESCO House of Service at no obligation.



Kaiser Aluminum

The nation's largest producer of
aluminum weatherproof conductor and triplex

Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Palmolive Bldg., Chicago 11, Ill.; Executive Office, Kaiser Bldg., Oakland 12, California.

Compare your savings with these Kaiser Aluminum weatherproof conductors:

	Per 1000 Ft. Lbs.	Cost		Per 1000 Ft. Lbs.	Cost
#6 Solid Copper TBWP*	112	$ 46.73	2/0 7 Strand Copper TBWP*	522	$204.99
#4 Solid Alum PE (2/64)	48	26.50	4/0 7 Strand Alum PE (4/64)	261	136.00
#4 Solid Alum Neo (3/64)	64	26.50	4/0 7 Strand Alum Neo (4/64)	306	136.00
#2 7 Strand Copper TBWP*	270	111.70	4/0 7 Strand Copper TBWP*	800	312.56
1/0 7 Strand Alum PE (4/64	141	69.60	336400 CM, 19 Str. Alum PE (4/64)	388	213.00
1/0 7 Strand Alum Neo (4/64)	172	69.60	336400 CM, 19 Str. Alum Neo (5/64)	469	228.00

Mar. 17, 1954 prices based on 30,000# —F.O.B. Destination *URC Copper Triple Braid Weatherproof

FAST DELIVERIES FROM YOUR GESCO WAREHOUSE

ALABAMA
Mobile ..... 54 Eslava St.
ARIZONA
Phoenix ..... 441 W. Madison St.
Tucson ..... 2 East Sixth St.
ARKANSAS
Little Rock ..... 601 East Markham St.
CALIFORNIA
Bakersfield ..... 1134 33rd St.
Fresno ..... 1234 "O" St.
Long Beach ..... 840 W. Twelfth St.
Los Angeles ..... 700 Turner St.
Oakland ..... 5400 Hollis St., Emeryville 8
Sacramento ..... 1131 S. St.
San Bernardino ..... 485 So. "I" St.
San Diego ..... 450 Second Ave.
San Francisco ..... 1201 Bryant St.
Stockton ..... 24 No. Aurora St.
COLORADO
Denver ..... 1429 Eighteenth St.
CONNECTICUT
Bridgeport ..... 1899 Seaview Ave.
Hartford ..... 2964 Main St.
New Haven ..... 74 Forbes Ave.
Waterbury ..... 23 Nichols Drive
DELAWARE
Wilmington ..... 310 S. Market St.
DISTRICT OF COLUMBIA
Washington ..... 705 Edgewood St., N.E.
FLORIDA
Jacksonville ..... 530 East Forsyth St.
Miami ..... 811 N. W. First Ave.
Orlando ..... 523 North Garland St.
Tallahassee ..... 705 So. Woodward St.
Tampa ..... 514 South Morgan St.
GEORGIA
Albany ..... 410 Hodges Ave.
Atlanta ..... 172 Haynes St., S.W.
Augusta ..... 1448 Reynolds St.
Savannah ..... 301 E. Bay St.
IDAHO
Boise ..... 618 S. 8th St.
ILLINOIS
Chicago ..... 845 S. Clinton St.
Peoria ..... 800 South Adams St.
Rockford ..... 810 20th St.
Springfield ..... 1007 E. Jefferson St.
INDIANA
Evansville ..... 2000 North New York Ave.
Fort Wayne ..... 1609 So. Calhoun St.
Hammond ..... 506 Fayette St.
Indianapolis ..... 1250 Stadium Drive
Muncie ..... 204 E. Willard St.
South Bend ..... 424 East Monroe St.
Terre Haute ..... 801 Poplar St.
IOWA
Des Moines ..... 108 East 4th St.
KANSAS
Topeka ..... 115 Jackson Street
Wichita ..... 800 E. First St.
KENTUCKY
Harlan ..... Hoskins St.
Lexington ..... 309 North Ashland Ave.
Louisville ..... 2311 So. Brook St.
Paducah ..... 301 S. Second St.
LOUISIANA
New Orleans ..... 4221 Bienville St.
Shreveport ..... 1430 Dalzell St.
MAINE
Bangor ..... 840 Hammond St.
Portland ..... 170 Anderson St.
MARYLAND
Baltimore ..... 1500 Barclay St.
Hagerstown ..... 1095 Jefferson Blvd.
MASSACHUSETTS
Boston ..... 145 North Beacon St.
Springfield ..... 484 Worthington St.
Worcester ..... 163 Mechanic St.
MICHIGAN
Detroit ..... 680 Antoinette St.
Flint ..... 4705 No. Dort Highway
Grand Rapids ..... 305 Fulton St., W.
Kalamazoo ..... 112-114 Parkway Ave.
Lansing ..... 428 N. Grand Ave.
Saginaw ..... 125 Davenport St.
MINNESOTA
Duluth ..... 102 W. Michigan St.
Minneapolis ..... 63 S. 13th St.
St. Paul ..... 174 E. 6th St.
MISSISSIPPI
Jackson ..... 610 Gesco Place
MISSOURI
Cape Girardeau ..... 402 S. Sprigg St.
Joplin ..... 922 Pennsylvania Ave.
Kansas City ..... 2101 Broadway
Springfield ..... 1301 W. Webster St.
St. Louis ..... 2653 Locust St.
MONTANA
Billings ..... 2710 Montana Ave.
Butte ..... 900 E. Front St.
NEBRASKA
Omaha ..... 914-20 No. 18th St.
NEW HAMPSHIRE
Manchester ..... 57 Bedford St.
NEW JERSEY
Newark ..... 254-284 Elizabeth Ave.
Paterson ..... 561 E. 31st St.
Trenton ..... Brunswick Circle Extension
NEW MEXICO
Albuquerque ..... 820 No. First St.
NEW YORK
Brooklyn ..... 135 Kent Ave.
Buffalo ..... 960 Busti Ave.
Hicksville ..... Broadway & Fourth St.
New York ..... 585 Hudson St.
Niagara Falls ..... 11th St. & Whitney Ave.
Rochester ..... 67 Mortimer St.
Yonkers ..... 16 Harrison Ave.
NORTH CAROLINA
Asheville ..... 47 Rankin Ave.
Charlotte ..... 700 Tuckaseegee Road
Fayetteville ..... 461 Robeson St.
Greensboro ..... 1111 Willowbrook Drive
Greenville ..... 200 Hooker Rd.
Raleigh ..... 800 W. Poole Ave.
OHIO
Akron ..... 225 East Mill St.
Canton ..... 123-5 Sixth St., S.W.
Cincinnati ..... 215 W. 3rd St.
Cleveland ..... 4958 Woodland Ave.
Columbus ..... 146 N. 3rd St.
Dayton ..... 601 E. 3rd St.
Portsmouth ..... 1723-27 Tenth St.
Toledo ..... 28 No. St. Clair St.
Youngstown ..... 265 West Rayen Ave.
OKLAHOMA
Oklahoma City ..... 127 E. California Ave.
Tulsa ..... 14-18 N. Guthrie St.
OREGON
Medford ..... 121 W. 4th St.
Portland ..... 300 N. W. 14th Ave.
PENNSYLVANIA
Allentown ..... 1249 Liberty St.
Erie ..... 824 E. 9th St.
Johnstown ..... 80 Hickory St.
Philadelphia ..... 429 N. 7th St.
Pittsburgh ..... 200 West River Ave.
Reading ..... 447 N. Front St.
Scranton ..... 204 Monroe Ave.
West Phila. ..... 3417 Garrett Rd., Drexel Hill
Wilkes-Barre ..... 85 Union St.
RHODE ISLAND
Providence ..... Harris Ave. & Acorn St.
TENNESSEE
Chattanooga ..... 112-114-116 W. 13th St.
Johnson City ..... 425 W. Walnut St.
Knoxville ..... 701 W. Jackson Ave.
Memphis ..... 500 South Front St.
Nashville ..... 90 Peabody St.
TEXAS
Abilene ..... 190 Locust St.
Amarillo ..... 701-711 E. 5th Ave.
Beaumont ..... 1295 Pearl St.
Corpus Christi ..... 1134 E. Port Ave.
Dallas ..... 1811 N. Lamar St.
El Paso ..... 300 Dallas St.
Fort Worth ..... 409 Jones St.
Houston ..... 1312 Live Oak St.
Lubbock ..... 221 Avenue H
San Antonio ..... 1801 Broadway
Tyler ..... 416 No. Broadway
Waco ..... 217 So. Fourth St.
UTAH
Salt Lake City ..... 312 W. 2nd South St.
VERMONT
Burlington ..... 316 Pine St.
VIRGINIA
Hampton-Newport News
1247 39th St. Highway, Hampton
Norfolk ..... 709 E. 26th St.
Richmond ..... 1505 Sherwood Ave.
Roanoke ..... 515 Norfolk Ave., S.W.
WASHINGTON
Seattle ..... 1212 First Ave., S.
Spokane ..... 1805 Trent Ave.
Tacoma ..... 2316 A St.
WEST VIRGINIA
Wheeling ..... 1818 Eoff St.
WISCONSIN
Appleton ..... 116 W. Harris St.
Eau Claire ..... 515 Wisconsin St.
La Crosse ..... 222 Pearl St.
Milwaukee ..... 540 S. First St.
WYOMING
Casper ..... 428 So. Elm St.

GENERAL ELECTRIC SUPPLY COMPANY 5

Address_____

City_____ State_____

Please send literature on these products:_____

_____

_____

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Check here if you want a GESCO Product Specialist to call on you ☐

THIS COUPON

addressed to any GESCO warehouse listed above, will get you literature and other information on the advertisers in this section.

GENERAL ELECTRIC SUPPLY COMPANY

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Reader's Quiz

Speed Reduction on Shaded Pole Motors

QUESTION L25—What is the maximum percentage of speed reduction that is practical on a shaded pole motor? What is the best method of varying the speed?—H.G.C.

ANSWER TO L25—The maximum percentage of speed reduction on a shaded pole motor is theoretically almost 100%, however, in practice it is governed by two factors, namely, the cost of control equipment and the relative speed-torque characteristics of the motor and the load.

Highly competitive manufacturers use a small series switch to obtain three speed outputs, with the lowest about half full speed. There is no reason, other than cost, that this system could not be extended by proper design to finer speed control over a wider range. One method accomplishing this would be by means of a small variable ratio autotransformer. Naturally, the finer the control system, the greater its cost. Most normal applications do not require fine control.

The torque of the motor should be great enough to drive the load and the speed-torque characteristics of the load and driving motor should be compatible for stable operation. (That is, for an increase in speed at the operating point, the load torque increases faster than the motor torque; and for a decrease in speed at the operating point, the load torque decreases faster than the motor torque.) Without the particular application contemplated, it is impossible to assure proper performance. However, a simple graphic solution to the problem of minimum speed and to the problem of stability can be effected by plotting a family of motor curves (remembering torque varies as the square of the applied voltage) and superimposing the load's speed-torque curve on them.—J.S.

ANSWER TO L25—I do not believe a maximum figure can be given. It depends upon the motor and also the load. For a fan where the starting torque requirement is low it should be possible to reduce the full load speed appreciably. I suggest that an adjustable resistor be used in series with a motor lead. The adjustable feature will permit testing to determine how much speed reduction can be obtained.—P.S.

Lamp Replacement Schedule

QUESTION M25—Most fluorescent manufacturers offer a standard plan to anticipate failure of their lamps. We have a large number of incandescent lamps and are interested in such a preventive maintenance schedule, as regards lamp life. Do any readers have such a plan now in operation in their plants and how is it set up and handled?—L.W.F.

ANSWER TO M25—Where I am employed the Plant Engineer, Electrical Maintenance Department, does control approximately 7,000 fluorescent fixtures (of the two 40-watt fluorescent lamp size fixtures). This number of fixtures is distributed into three buildings.

Here, lamps are replaced only after being in service for 12 months or if the lamp ends appear dark as to show on the light meter a 25% less reading in footcandles, whichever is first. However, before changing these lamps, we find that by keeping a schedule, cleaning period of every lamp and fixture every three months, these lamps can stand up to a maximum of 12 months. Although now and then one or two dozen lamps must be changed every day, so as to keep the footcandle reading to a maximum, which is a must.

The day shift, consisting of a man and helper, per building, can keep up with the light program of preventive maintenance. Upon the second shift rests the responsibility of doing work which cannot be done during the day time, because of the necessity of shutdown, or of stoppage of work. Here, the man and his assistant, can clean the lamps and fixtures without interference to production or be in the way of anyone else.

Material on hand can be held to a minimum, complete fixtures on hand about ½%.

Ballasts, of the type required on the fixture, should have about 3% on hand, after one year of service of the present fixtures.

Starters, of the reset type (40-watt-FS-4), should be about 8%. Fluorescent lamps, of the make you want, with respect to color choice, should be about 10% on hand.

Asbestos fixture wire, black and white No. 14 gauge for service drops —two spools of each color for the first year.

For internal fixture-rewiring of No. 16 asbestos yellow, blue, black, white, red and red with black tracer on or an equivalent color now in presently wired fixtures—three spools each color, 250 feet per spool.

Fixture sockets on hand—3%, Starter sockets on hand—1½%, all to be had after the second year service ends.

Storage space for lamp boxes, to be available at any convenient location on each floor, where the ladders can be held near the door for easy accessibility, and means of testing those hard starting lamps and starters which fail to start-up.

These storage spaces should have a telephone extension, or a public address system with a speaker located near by to expedite service in the respective area requested.

The men who are available for this service should alternate in shifts, so as not to make the job too monotonous. —O.C.

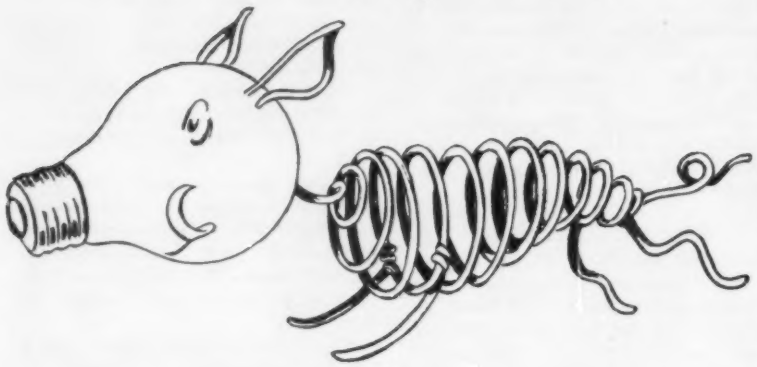
ANSWER TO M25—A comprehensive discussion of group lamp replacement is beyond the scope of a small paragraph. Accordingly may we refer you to two General Electric Lamp Division publications, namely LS-155 titled "Lighting Maintenance—Group Relamping" and LS-166 "Lighting Maintenance—Cleaning." These bulletins are available on request to the General Electric Company Lamp Division, Cleveland 12, Ohio. The papers discuss both fluorescent and incandescent systems.—J.S.

Electronic Tubes

QUESTION N25—I heard two competent engineers discuss electronic tubes. Part of the subject was how can a longer life be had from tubes. One engineer said that if the tube is in a vertical position it will last much longer. The other one said that this has nothing to do with tube life. Who is right?—M.D.

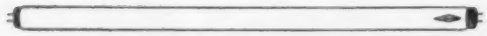
ANSWER TO N25—First of all, it is difficult to determine which type of electronic tube these engineers had reference to; therefore, each type would have to be referred to separately.

DON'T LET THIS **CUR-RENTELOPE**
GET AWAY WITH Your MONEY



The Cur-rentelope elopes with excess current if you don't watch out. The Cur has his lair in plants and offices that haven't followed the suggestions in the *Champion Maintenance Manual** — and that aren't equipped with the right lamps — efficient, long-lasting Champion Incandescent Bulbs and Fluorescent Tubes.

**May we mail you a free copy?*



CHAMPION LAMP WORKS
Broad Street, Lynn, Massachusetts

CHAMPION Lamps

To begin with, the type of mounting for vacuum type tubes would make no difference as to mounting position. Gas-filled tubes should be mounted in a vertical position so that the tubes can cool, which is vitally important to tube life. Mercury pool cathode type electronic tubes should be mounted in a vertical position for proper operation of the tube. In tubes with a glass envelope, if the tube is subjected to a cooling of the glass envelope, this would crack the glass and thence shorten tube life. If a tube is especially mounted to resist vibration, the replacement must be similar or else vibration on ordinary tubes will shorten their life. (I have reference here to the red tubes made by RCA.)

In all, if frequent tube burn-outs occur there is a possibility of defective components in either the plate, grid, cathode or heater circuits which above all should not be overlooked in the case of too frequent tube burn-outs or shortened tube life.—L.C.D.

ANSWER TO N25—If the design of a vacuum tube is such that it may be mounted in any position, then the actual mounting position will have no effect on tube life whether it be horizontal, vertical, or inclined.

Certain tubes are designed to be mounted vertical and may be mounted horizontal only if the plane of the grid and plate electrodes is orientated vertically. If tubes with very close electrode spacing are operating horizontal with the planes of the electrodes above each other, electrode expansion during tube heating in operation can cause the electrodes to sag into each other and produce short circuits in the tube. Some tube types, notably mercury vapor types, and some transmitting tubes, are designed to be mounted vertical, base down, and these can be seriously damaged if operated in any other position.

For a given tube type the RCA Tube Handbook HD13 gives the proper operating position.—F.J.T.

Dynamic Braking of Synchronous Motors

QUESTION P25—Nowhere can I locate a definition or description of what dynamic braking is or how it is accomplished. I understand that it requires a dc voltage to the revolving field of the synchronous motor. How does the dc voltage accomplish dynamic braking and what is the effect on the braking if the motor is running and the dc supply is interrupted? This subject is apparently quite important in industrial installations involving synchronous motors, and I would like to have references or information on it.—A.L.D.

ANSWER TO P25—All of your questions pertaining to the performance of induction motors during dynamic braking will be satisfactorily answered in a recent book by Philip L. Alger titled "The Nature of Polyphase Induction Machines" published by John Wiley & Sons, Inc. The information is on pages 97, 98, 143, and 144.—J.S.

ANSWER TO P25—Dynamic braking usually is used only on dc motors. What it actually does is use the retarding force of a generator to stop a motor (or slow it down).

The field of the motor is kept energized from the line supplying the motor. The armature is disconnected from the line and has a resistor connected across the armature terminals or brush holders. This resistor is large enough to handle armature current and is usually part of the starting resistance, which is used for both starting duties and dynamic braking.

When the load causes the armature to turn, and the field remains energized, then the armature has a current induced in it by its rotation in the magnetic field. This current flows through the resistance across its terminals. This induced current flowing in the armature produces a magnetic field which opposes the rotation or has a retarding force just the same as a dc generator has to the force rotating it. Actually when a motor is being braked by dynamic braking it is being used as a separately excited generator. There is a good description of dynamic braking in Chester L. Davies, Direct Currents, Volume I, published by McGraw-Hill.—L.O.W.

ANSWER TO P25—Dynamic braking of an electric motor can be defined as the conversion of the mechanical energy, stored in the rotor and associated gear, into electrical energy and this form, in turn, into heat. For dynamic braking the motor is disconnected from the supply lines, and excitation is so adjusted that the motor operates as a generator.

The simplest case is the dc series motor, as used for instance in street cars and trolley busses. For dynamic braking, the motor is disconnected from the supply and shunted by a load-dissipating resistor, preferably by the starting resistor. In dc shunt motors, the armature is disconnected from the supply and shunted by the load-dissipating resistance which, again, may be the starting resistor. An application of this scheme is in printing presses. Synchronous motors are braked dynamically in a similar way, for instance in electric ship propulsion plants.

Synchronous motors are braked dynamically by exciting the stator, and

For all-around utility... the BEST BUY is Ramset

FASTENING SYSTEM

SUPER-POWER JOBMASTER
for heavy-duty work
Operating length 15" Weight 7⅞ lbs.

TWO TOOLS IN ONE
JOBMASTER and
PLUS-POWER
JOBMASTER
Length 12"
Weight 6¾ lbs.

For your light-duty anchoring work into steel or concrete, requiring ¼" fasteners, the RAMSET JOBMASTER can't be matched for speed, ease, economy and wide versatility.

If ⅜" fasteners are called for, you can have a PLUS-POWER JOBMASTER, or attach a ⅜" assembly to your standard JOBMASTER. Thus you have two tools for slightly more than the cost of one.

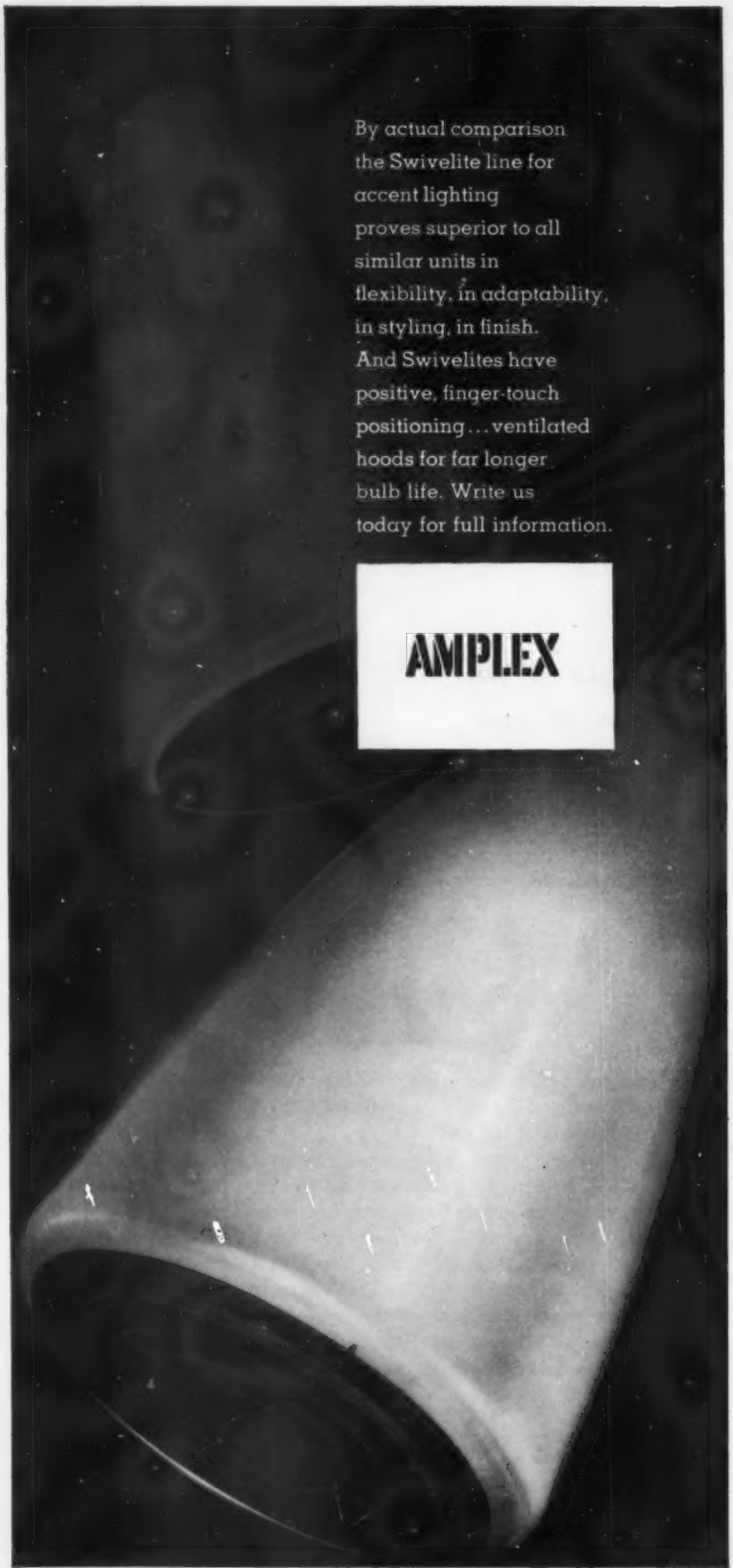
Where heavy-duty ⅜" fasteners are needed, the great driving power of the new SUPER-POWER JOBMASTER sets them instantly into 1" mild steel or into the hardest concrete.

Write us or ask your RAMSET dealer for on-your-job demonstration of the all-around superiority of RAMSET SYSTEM for ease, speed, utility and economy.

Ramset Fasteners, INC. Ramset Division Olin Industries, Inc.
12105 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

AN Olin PRODUCT



AMPLEX CORPORATION, DEPT. C-5, 111 WATER ST., BROOKLYN 1, N. Y.

more specifically, by exciting it asymmetrically. One can supply dc or single-phase ac between two phases, or between two phases tied together and the third phase. If the motor has a wound rotor (with slip rings) the heat can be dissipated in an extraneous load resistor bank. Applications are cranes and hoists using ac motors. If the rotor is a squirrel cage there is no possibility of connecting extraneous load resistors, and the heat is dissipated in the squirrel cage itself. An application is a run-out table in a strip mill.

For details of connection for the different types of motors, refer to Knowlton, Standard Handbook of Electrical Engineers, McGraw-Hill under Braking, dynamic—L.F.R.

Duplex Receptacles

QUESTION—Q25—In installing duplex receptacles, can I connect a second duplex outlet to the first by connecting on the first duplex receptacle, or would it have to be from a junction box?—L.R.L.

ANSWER TO Q25—Yes, a second duplex outlet may be connected to the first without going through a junction box. However, Section 3007 of the National Electric Code states that, except as permitted in Section 3369, a box shall be installed at each outlet, switch or junction point of conduit, electrical metallic tubing, surface metal raceway, armored cable, or nonmetallic sheathed cable, and at each outlet and switch point of concealed knob and tube work. Section 3369 states that switch, outlet and tap devices of insulating material may be used without boxes in exposed cable wiring. These are devices such as those used with non-metallic sheathed cable. Section 3709 limits the maximum of conductors, not counting fixture wires, permitted in outlet and junction boxes.

The purpose of the outlet box is to provide an enclosure for the circuit wires where they are brought out for connection to a fixture or other device. This enclosure is especially necessary because of splices which the box may contain. The box should be made complete by means of a cover.

A very good reference for problems concerning the electrical code is Abbott's "National Electrical Code Handbook", published by the McGraw-Hill Book Company.—J.W.W.

ANSWER TO Q25—It would be advisable to check the entire circuit back to the fuse box or switchboard and make sure the circuit would not be overloaded and voltages are not below normal when all equipment is being

used. If the voltages are below normal or circuit overloaded it would be necessary to run a new circuit back to fuse box or switchboard. If voltages and currents are O.K. and new duplex receptacle will not cause overload or low voltage, it could be connected at first duplex, if there is space in box and receptacle contacts at terminals are large enough.—E.B.

Can you ANSWER these QUESTIONS?

QUESTION C26 — We have two dairy barn ventilators as follows: ½ hp, 115 volts, 2.5 amps, 60 cycle and 1725 rpm speed, which exhaust the barn too rapidly, causing very low temperatures in the building. As a result, the fans are not used and now we have excessive moisture.

How can I reduce the speed of these motors so that they will move less air? —G.M.D.

QUESTION D26 — If three transformers with different impedances are hooked delta-delta, what would cause a circulating current? Is it the difference in voltage, the difference in impedance or a combination of both? —M.D.

QUESTION E26 — Which overload relays lose their calibration sooner, the bimetallic, the oil dashpot or the solder type?—H.S.

QUESTION F26—Is there some method, besides the comparison ohmmeter way, of testing for shorts in fields of series motors used in drills and saws?—H.G.C.

QUESTION G26—In an outdoor installation of 40-watt, 48-in., T-12 fluorescent lamps for area lighting at a drive-in diner, the fixtures are mounted under the eaves of the roof. This installation was made last summer and has operated successfully until the recent cold spell, when it was observed that during periods of temperature in the range of 30° to 10°F the light output fell off markedly and a shadow seemed to spiral down the tube. There was considerable difficulty in starting the lamps at this temperature, and below 10° the lamps would not function.

Can some one explain this phenomena and suggest a possible remedy? —L.D.B.

PLEASE SEND IN YOUR ANSWER BY JUNE 15

PROOF of HOLDING POWER . . .

RAILROAD ELECTRICIAN SAYS:

"I am sending you a sample (see photo above) of what they (Rawlplugs) are capable of doing . . . We were removing some old conduit from an outside wall and this piece of brick was pried off with the 1" conduit used as a lever.

I cannot remember how long these plugs had been installed, but believe it to be between twenty and thirty years."

J. G. COLWALL, Montgomery, Alabama

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

VOTE HERE . . . GET SAMPLES . . .

Request samples by attaching coupon below to your business letterhead.

MARK X for the products you have used.

MARK ✓ for the products you have not used and of which you would like to have samples.

☐ RAWLPLUGS: Universal screw anchor for any material. The original fibre plug for wood and lag screws.

☐ RAWL-DRIVES: Drives like a nail into a drilled hole. Holds like a bolt. Use only in hard materials.

☐ RAWL-TAPERS: A machine screw anchor that fits the hole drilled either by a new or worn drill.

☐ RAWL TOGGLE-BOLTS: For anchoring any fixture or utility in hollow walls or ceilings.

☐ RAWL CARBIDE DRILLS: Spiral precision tool for rotary drill or hand brace. Sizes 5/32" to 1½".

☐ RAWL HAMMER-SETS: Heavy duty threaded type machine bolt anchor.

☐ RAWL-ANCHORS: For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.

☐ RAWLDRILLS: For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

☐ DIMENSIONAL CHART of above products

SUPPLIER .....

THE RAWLPLUG COMPANY, Inc.

271 CHURCH STREET • NEW YORK 13, N. Y.

IDEAL Offers a Complete Line of WIRING TOOLS

. . . to Make Any Wiring Job Easier!

. . . to Cut Your Wiring Costs!

Your electrical wholesaler handles a complete line of IDEAL Wiring Tools. He maintains ample stocks for your convenience—so that you can have the right tools for any wiring job—*right when you need them!* He is as near as your telephone—your dependable source for the best wiring tools you can buy. Make it a habit to call upon your IDEAL Distributor for all your wiring tool needs.

IDEAL FISH TAPES, REELS & PULLERS

3 Tools in One
Speeds Wiring
Protects Tape

Reel gives BIG pulling power, makes long conduit runs easy to handle. Actually saves up to 50% in fishing time. SAFER because tape is always under control, can't spring loose or kink. Reel protects hands, eliminates special pliers, pullers or bare hand pulling. Tape is finest flat, tempered spring steel. Available in five sizes and lengths, 50 to 200 feet. IDEAL Fish Tapes (without reel) seven stock sizes—50 to 200 feet.

Price: 100 ft.-⅛"x.060" with reel—$6.40

IDEAL Coil-Flex FISH TAPE

(Patent Pending)

For All Types of Conduit—Including Aluminum

Flexible coilspring wound around airplane type cable. Cannot cut or damage aluminum and is easy to push or pull through multiple 90° bends. Comes in 25-ft. lengths—easily joined together or attached as a leader. Factory tested for 400 lb. pull.

Price: $8.50

IDEAL NYLON COVERED FISH TAPE

Tough Nylon Cover Gives Added Protection

Gives more protection to workmen and equipment than bare fish tape when pulling new wires into live panel boards, switches and other "hot" equipment.

Price: 100 ft. with reel—$14.00
without reel—$ 9.50

IDEAL ROUND FISH TAPE

For Easier Fishing in Small Conduit

Made especially for use in conduit ½" or less. Easily goes through small radius bends. Has less friction resistance than flat tape, rolls onto reel without kinking or bending. With or without reel.

Price: 100' with reel—$7.50

IDEAL FISH TAPE LEADER—helps flat tape to slide through conduit. 20 inches long. **Price: $3.70**

IDEAL FISH TAPE BALL—makes it easier to attach wires to flat fish tape. Holds up to 6 No. 10 bare wires. **Price: $1.00**

IDEAL "E-Z" STRIPPER

(Patented, No. 2,179,581)

Rugged All-Steel Construction for Fast, Clean Heavy-Duty Stripping

As easy to use as pliers. Will not score or damage wire. At end of stripping stroke, automatic lock prevents snap-back and crushing of stranded wire. Wire sizes stamped above stripping holes for easy identification. Replaceable, hardened steel blades. Eight models handle wire gauges from No. 8 to No. 26; also 300 ohm TV downlead and most non-metallic sheathed cable.

Price: $5.25

IDEAL Stripmaster

(Patented, No. 2,523,936)

Unexcelled for Fast Light and Medium-Duty Stripping of Solid or Stranded Wire

Exclusive "one-squeeze" action strips wire clean in 2 seconds. Automatic feature holds jaws open after stripping to permit removal of wire and prevent crushing. Six models for all wire gauges from 8 to 26; also for POSJ.

Price: $4.95

YOU NEED!

IDEAL THE SUPER-SAFE VOLTAGE TESTER

You Can't Buy a Safer Voltage Tester —To Save Your Life!

Provides *double protection*—a calibrated solenoid indicator and a neon test lamp, each independent of the other. *No chance of failure to detect voltage.* Handy center mount for test prod keeps indicator always in line of vision. Fully enclosed case of double-strength, seamless plastic, with plastic name plate bonded to case—*no surface metal.* Moisture-tight, molded rubber prod handles with "No-Slip" safety rings are mounted on 30" neoprene leads. Prod storage in case completely shields sharp tips when not in use. Instantly tells whether a line is hot. Gives you these tests: Normal voltage from 110 to 550 Volts AC or 110 to 600 Volts DC. Whether AC or DC, Frequency (25 or 60 cycle), DC Polarity, Circuit Continuity, Hot Lines, Blown Fuses, Grounds.

Price: $10.90

IDEAL INDUSTRIAL "TEST-GLO"

The Safest, Easiest-To-Use Test Light for Electrical Circuits, Sparkplugs, Motors, Fuses

Highest quality resistors between test-prod and lead reduce voltage reaching leads. Long, thin handles for deep probing have safety rings to prevent accidental contact with prods. Enclosed neon test lamp is at front of prod handle, always in line of vision. Glows on 80 to 600 V. AC or DC with intensity indicating relative voltage. Leads are 24" long. Cement-sealed, moisture-proof, ruggedly built for knock-about use.

Price: $2.50

IDEAL CONTINUITY TESTER

Penlite Battery Powered—Tests Dead Circuits Without Need for Live Wire Connections

Simple, inexpensive. Fits in pocket like a fountain pen. Does away with need to apply full current on unknown or untested circuits. For testing building and household wiring, communication equipment, control panels, etc. Test for electrical continuity between two points is made by applying the 4-ft. clip to one point in the circuit and touching the prod-clip to the other. Detachable test lead.

Price: $2.50

IDEAL "SAFE-T-GRIP" FUSE PULLER

Assures Safe, Positive Grip

Formed to fit the fingers—no slipping! Does away with the danger of pulling and replacing cartridge fuses by hand and bending fuse clips through improper removal. Also adapted for loose cut-out clips, handling laboratory test tubes, "live" electrical parts, etc. Strong, laminated fibre construction. High dielectric properties.

Approved as standard by safety departments of many industrial and utility plants. Three sizes for practically all fuses.

Price: Pocket Model—$.95

IDEAL DELUXE CABLE RIPPER

Rips Outer Sheath From Non-Metallic Cable Instantly

Built to last for years. Faster because cable is inserted into cradle of the tool from side. No time lost in threading into cutters, etc. Depth of cutting blade is adjustable for different cable sizes. Sturdy aluminum frame, replaceable steel blade. Handles cable up to ½" O.D.

Price: $1.95

IDEAL CABLE RIPPER AND WIRE GAUGE

Cuts non-metallic sheathed or lead-covered cable cleanly, easily in one operation. Just squeeze onto cable and pull. Can also be used for ripping outer sheathing of cords, lead cables, etc. with O.D. up to ⅜".

Price: $.43

IDEAL ELECTRICIANS TAPE

You need ALL THREE to meet ALL insulating needs! In popular sizes, conveniently packaged.

IDEAL FRICTION TAPE

Extra-strong, coated four times for high insulating quality and extra long life. Covers perfectly — goes on easily — sticks quick and fast. All edges are non-raveling and free of frays. ¾" width available in 13', 60' and 82½' lengths. Special widths and lengths available on special order to large users.

IDEAL RUBBER TAPE

High dielectric strength—up to 18,000 volts through one thickness. Fuses instantly, highly elastic, contains no corrosive chemicals. ¾" width in 22' and 30' lengths.

IDEAL PLASTIC TAPE

The 2-in-1 electrical tape—insulates and protects in one neat operation. Stretches both ways, fits snugly to irregular shapes. Excellent resistance to weather, oils, grease, many corrosive chemicals. ¾" width in 20' and 60' lengths.

IDEAL WIRE LUBE

Makes Wire Pulling Faster, Easier—Protects Insulation

Provides a lubricated "ride" for wire or cable, then quickly dries and shrinks to fine powder that makes it easier to remove wire from conduit or add additional wires. No sticky sludge to form a bond between wire and conduit. Easily applied by hand or brush. Noncorrosive, non-combustible—harmless to hands. For use on rubber, lead or plastic covered wire cable. (Cannot be used on asbestos covered wire.) In 1-qt. and 1-gal. cans, or 2-gal. to 5-gal. pails.

Price: 1 gal. can—$2.00

SEND FOR CATALOG DATA

IDEAL INDUSTRIES, Inc. 1041 Park Avenue, Sycamore, Illinois

IDEAL

Please send me catalog data on the items checked

- ☐ Fish Tape Reels and Pullers
- ☐ Flat Fish Tape
- ☐ "Coil-Flex" Fish Tape
- ☐ Round Fish Tape
- ☐ Nylon Covered Fish Tape
- ☐ Fish Tape Leader
- ☐ Fish Tape Ball
- ☐ Voltage Tester
- ☐ "R-Z" Stripper
- ☐ Stripmaster
- ☐ Wire Lube
- ☐ "Test-Glo"
- ☐ Continuity Tester
- ☐ Deluxe Cable Ripper
- ☐ Cable Ripper and Wire Gauge
- ☐ "Safe-T-Grip" Fuse Puller
- ☐ Electricians Tapes

NAME_____

COMPANY_____

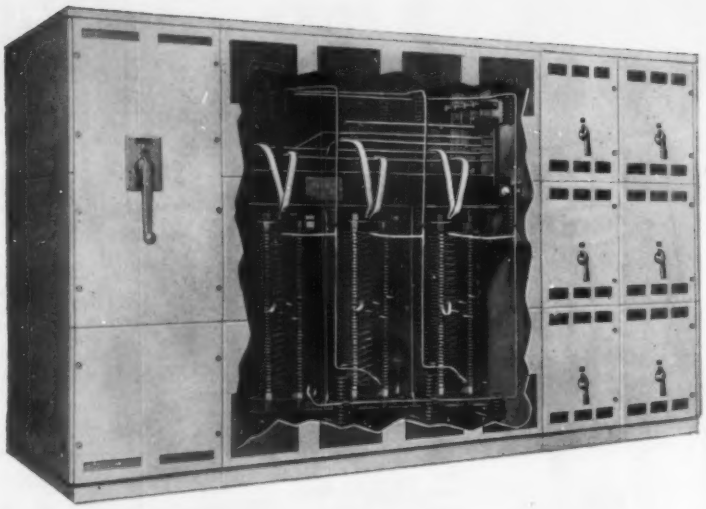
ADDRESS_____

CITY_____ ZONE_____ STATE_____

Wagner®
TRANSFORMERS
...the choice of leaders in industry

for a reliable load-center power supply

always specify...



Wagner *PREDESIGNED*

DRY TYPE TRANSFORMERS

you gain because:

- you save **shipment time**
- you save **job engineering costs**
- you get **full Wagner Quality with switchgear of your choice**

Wagner "Predesigned" Dry Type Substation Transformers are carefully engineered for dependable load-center service. Predesigning completely eliminates individual job engineering . . . reduces your costs . . . and saves shipment time.

Wagner "Predesigned" Dry Type Transformers consist of standardized core and coils rated from 112.5 to 2000 kva. They are designed for indoor installation in dry, clean, well-ventilated locations. All unit substation builders have the information and coordination necessary to use these transformers with switchgear of your choice.

You can specify the Wagner Transformer that exactly meets your load-center distribution requirements—be assured of all the quality necessary to meet heavy industrial demands—and gain a substantial advantage in delivery time and in cost.

Investigate the many advantages of specifying Wagner "Predesigned" Dry Type Unit Substation Transformers for your next load-center installation. Consult the nearest of our 32 branch offices, or write direct to us.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

T54-10

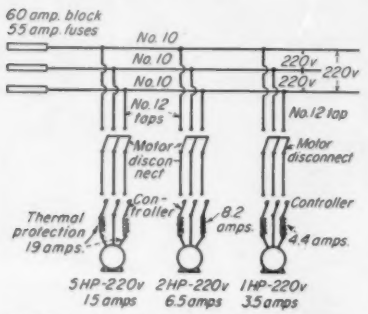
Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Several Motors—One Branch Circuit

Q. *Is there any Code violation in the motor installation shown in the diagram below? The motors are all 3 phase, 220 volts, 60 cycle induction type. They are connected to one branch circuit as permitted in Section 4343. Each motor is protected by thermal cutouts.—E.T.H.*



Size br. cir. fuse. 15 x 300% = 45+6.5+3.5 = 55 amps.
Size of motor taps. 1/3 x 55A = 19 amps. No. 12 cond
5 HP motor overcurrent protection 125% x 15A = 19 amps
2HP " " " 125% x 6.5A = 8.2 "
1 HP " " " 125% x 3.5A = 4.4 "
Size of motor br. conductors 125% x 15 + 6.5 + 3.5 = 29 amps. No. 10 cond's

A. Section 4343 of the Code permits two or more motors to be connected to the same branch circuit, as shown by you, provided several conditions, as covered by this rule, are satisfied.

The first consideration concerns the size of the branch circuit fuse which may be placed in series with the smallest thermal cutout in the group of motors involved. Section 4330 provides that the fuse shall not exceed four times the rating of the motor unless approved for group installation. In the case shown, the smallest motor, 1 hp, has a full load current rating of 3.5 amperes, and the branch circuit fuse should not exceed four times this value, 14 amperes, unless the thermal device and the controller are approved for group installation. Such types of controllers are approved by Underwriters' Laboratories and the device is marked to show the maximum size fuse which may be used in series with the thermal cutout involved. It therefore follows that if the controllers and the thermal cutouts, shown on your illustration, are approved for group installation and a 55-ampere fuse is recognized for use in series with the thermal cutouts, then this provision would be satisfied.

Reference to the Electrical Equipment List of U. L. indicates that several manual controllers of this nature are approved, but such approval appears to be limited to motors of 3 hp or less. It also appears, with one exception, that no magnetic controllers are approved for group fusing. If this information is correct, it appears that the 5-hp motor could not be grouped with the other smaller motors, and if magnetic controllers are involved, there would be a question concerning their use with group fusing. This point should be thoroughly checked before any installation such as you propose is made.

The second consideration concerns the size of the branch circuit fuse, as covered by Section 4342. We have shown the computation involved on the diagram, assuming that the 5-hp motor is one of squirrel cage type with full-voltage starting. The figures show that a 60-ampere block with 55-ampere fuses must be used. The size of the fuse may be reduced when fuses of the time delay type are used as covered by section 4346.

The taps to each motor appear to be in compliance with the provisions of Section 4343 b-5.

It appears to me that this method of grouping motors on one branch circuit is not desirable on most applications and should be avoided especially in view of the many requirements involved and the interruption of the service rendered to several motors when only one is in trouble. A simple alternative which eliminates these undesirable features would be to install fused motor disconnect switches and thus establish individual motor branch circuit protection.—B.A.McD.

Aluminum Conductors

Q. *I have been asked to accept an installation consisting of bare aluminum conductors, which will be run for approximately 200 feet on glass insulators high overhead in a fertilizer plant, to supply power to a large motor operating a mixing machine. I am assured by the management that no combustible ingredients are used in the fertilizers produced and that they will consist primarily of the ingredients used to make phosphate type of fertilizer. Would the open conductors if properly spaced used in such an installation be a violation of the Code? —M.P.*

A. While it is true that the average phosphate fertilizer plant does not contain dusts of a combustible nature, it is true many of these plants have corrosive atmospheres which will rapidly attack certain types of metal, and as aluminum wire is rather susceptible to some types of corrosion common to occupancies such as this, Section 1110 of the Code would prohibit its use. Furthermore, the use of bare aluminum would throw it into the busway class and open bus cannot be used where subject to corrosive vapors. If an insulated aluminum wire were used and care was taken at each terminal to carefully coat all exposed aluminum with a generous coating of an insulating varnish like "Glyptal", you would have an insulation which would be acceptable in such a location. —G.R.

Service Entrance Fuses

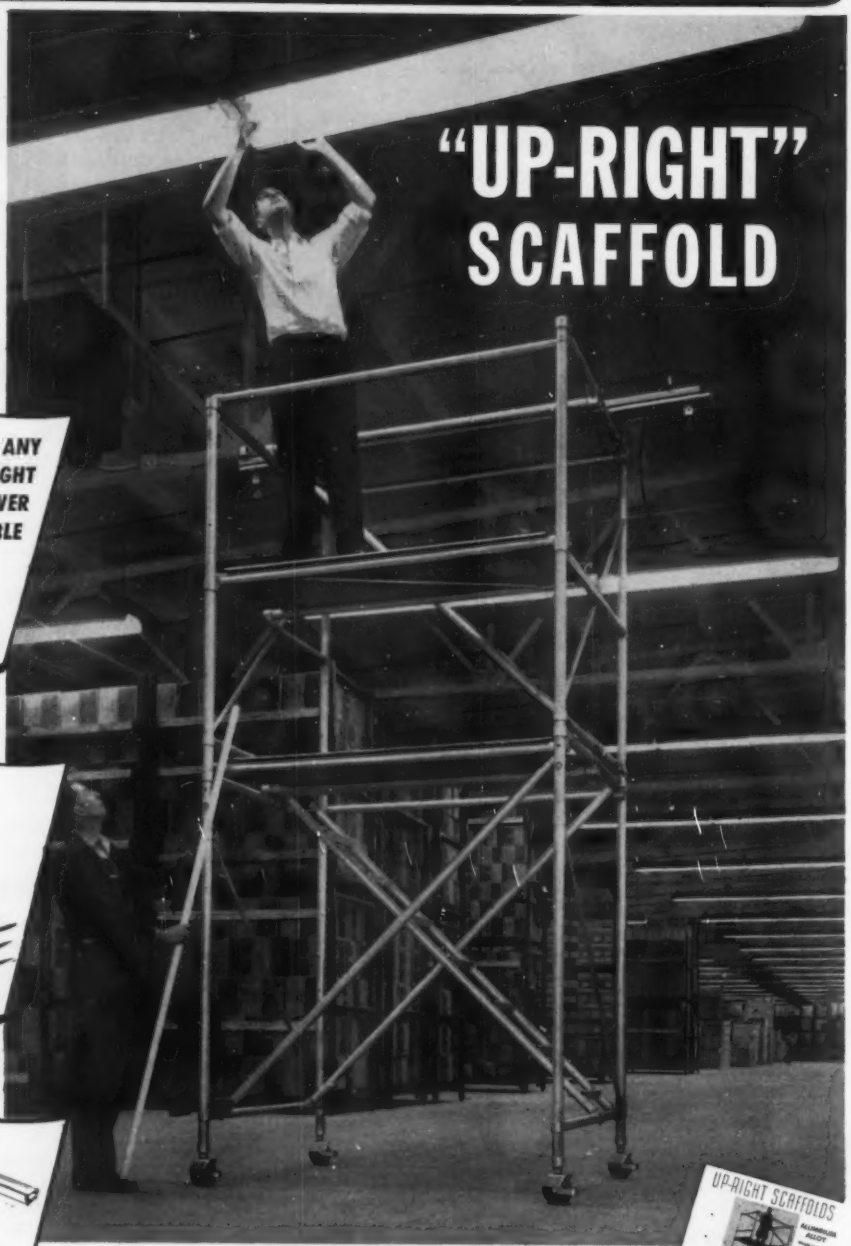
Q. *In accordance with Rule 2357 a service switch generally has a rating of 60 amperes, but in our territory we have some small installations where the customer installs a 30-ampere, 2-wire entrance. The meter is installed outdoors in a meter enclosure with the switch indoors. This switch would be externally operable with a solid neutral. My question is—Does this switch have to be of the accessible fuse type or of the dead front type to meet Code requirements?*

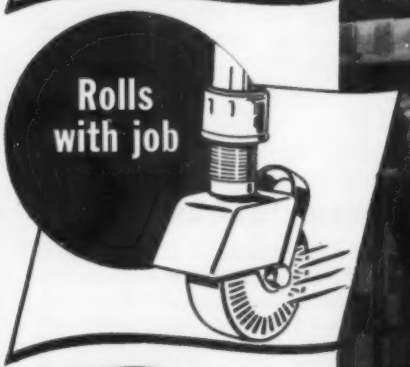
The reason for bringing this question up is the fact that on 30-ampere and 60-ampere entrances with meters outdoors, switches have sometimes been installed that are not dead front or accessible fuse type and do not have interlocking covers.—W.D.C.

WALTER D. VANCE, JR., *Vice President* • *California Electric Co., reports:*

"We saved 14 days installing 527 fixtures by using 'UP-RIGHT' Scaffold-on-Wheels"

Man-hour savings on this General Motors warehouse job amounted to over 40%. Up-Right Scaffold is so light it is easily assembled by one man. Individual 1 piece aluminum alloy sections are unfolded and set one on top of the other. They lock into place instantly.





Write for descriptive circular ➡

"UP-RIGHT" SCAFFOLDS

Dept. 159 • 1013 Pardee Street • Berkeley, California

Factories: Berkeley, Calif. and Teterboro, N. J. • Offices in all principal cities

A. There is nothing in the Code which states definitely that the service has to be of either type.

It should be noted that Section 2356 states that "An enclosed service switch or circuit breaker shall be externally operable". There is no requirement that it be enclosed.

In Section 2373 the service overcurrent devices are permitted to be located so that they may be not readily accessible. Under these conditions branch circuit overcurrent devices must be installed in an accessible location. Furthermore the rating of these service devices must be higher than the branch circuit devices.

For example, suppose we require only one 15-ampere circuit for the installation. The 30-ampere, 2-wire switch would be fused with a 15-ampere fuse and thus serve as the branch circuit protective device also. However if the service switch is kept sealed as it would be in a service switch—meter service entrance sequence—then a second accessible branch circuit fuse would have to be installed and the service fuse would have to be larger than this 15-ampere branch circuit fuse.

In most cases, UL approved service equipment is of the enclosed type. Both the accessible fuse type and the dead front type is approved.—B.Z.S.

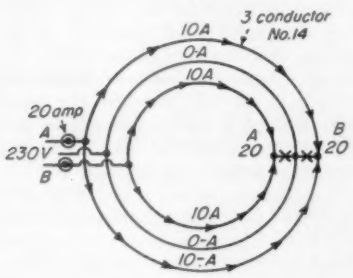
Branch Circuit Loop Design

Q. *Here is the loop idea, which means that conductor A is really made up of two No. 14 conductors in parallel with 20-ampere protection. Conductor B also is made up of two No. 14 in parallel and the ground conductor is the same.*

We have required No. 12 wire as a minimum for certified adequate wiring. I am trying ways and means of reducing the cost. Section 3105 of the Code says you cannot run wires in parallel. I do not think it applies to this arrangement. Would like Code committee to consider this. Advantages: Circuit has equivalent of 30-ampere capacity per leg although only fused at 20 amperes. Six No. 14 wires in a box requires a smaller box than six No. 12 which is our present requirement. 120/240 volts in most convenience outlets in a house could be converted to a polarized 120-240-volt, 3 wire for ¾-ton, ¾-h.p. room coolers. Is there any Code violation involved? Economy in wire use (50 ft. of 3-conductor same as two 24-ft. lengths of 2-conductor).—R.C.

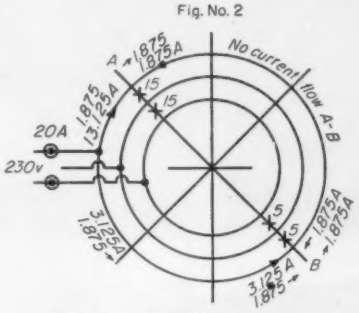
A. The illustration covered by Fig. No. 1 shows the loop wiring circuit which you present for consideration and comment. With the load of 40 amperes as shown located at the mid-point of the loop, we would have theoretically two sets of two No. 14 conductors in multiple, at 115 volts to ground, serving the load. Each No. 14 conductor would carry 10 amperes but the main, feeding the loop, would carry 20 amperes and the branch circuit is fused at 20 amperes. There are in my opinion, two Code rules involved and both are violated by the proposal. The first concerns Section 2403 which limits the overcurrent protection of a conductor to its rated current-carrying capacity. In the case of a No. 14 conductor, the limit is 15 amperes. While it is evident, under the conditions shown, that the load on each parallel conductor would be limited to 10 amperes, only two-thirds the rated current-carrying capacity of a No. 14 conductor, it is also significant to note that the conductors do not have the protection from short-circuits or grounds afforded by a 15-ampere fuse as required by the Code. The next violation concerns the use of conductors in multiple as covered by Section 3105. The wording of this rule implies that conductors smaller than 1/0 should not be run in parallel and I do not believe it ever was intended to use No. 14 conductors for this purpose.

Fig. No. 1



Closed loop
No. 14 overfused 5A
Connected load 40A

Fig. No. 2



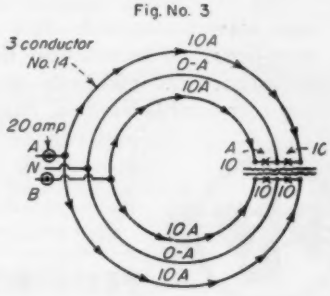
Parallel paths to load A
One 10'– amps 13.125
Other 70'– amps 1.875
Parallel path to load B
50'-1.875 amps
30'-3.125 amps
Load not served through parallel paths

As the conditions of loading the circuit vary, the application of the rule involved with multiple conductors becomes more complex. The parallel paths feeding each load are not of the same length as required and currents flowing in opposite directions in each conductor are neutralized so that only part of the circuit is used and the loop becomes an ordinary 3-wire 115-230 volt circuit. I believe Fig. No. 2 clarifies this point.

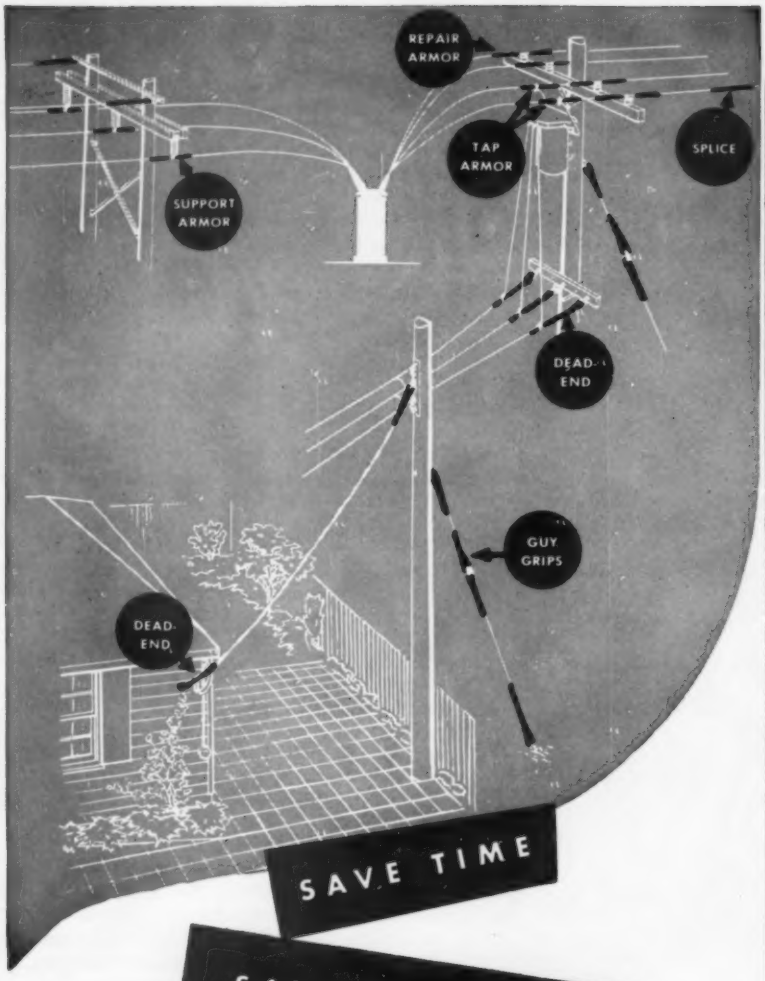
For the purposes of comparison with your proposal, I have shown by Fig. No. 3 a 3-wire, 115/230-volt, branch circuit run in the shape of a loop which is open at the mid-point as shown. Under the conditions of fusing you propose, this circuit would have the same capacity and the same advantages as your circuit. Here, we eliminate the use of conductors in multiple. 115 or 230 volts would be available at each outlet. The load on each conductor is limited to 10 amperes by the 20-ampere fuse but the violation, common to both methods, remains. The Code does not permit a 20-ampere fuse to protect a No. 14 conductor on a branch circuit of this nature. This circuit fused at 15 amperes would comply with Code requirements. The conductors would only carry 7.5 amperes. This, however, is not unusual. A 15-ampere circuit, run in a straight line, which feeds ten 1.5-ampere outlets will carry only 15 amperes to the first outlet and the No. 14 wire running between the last two outlets will carry only 1.5 amperes. The average use of the full capacity of the wire would still remain 7.5 amperes. The principle is inherent with all wiring circuits and I know of no easy solution that would result in obtaining the use of the full current-carrying capacity of a conductor throughout its entire length, except when such a conductor feeds a unit or acts as a feeder.

In support of your proposal to fuse No. 14 wire at 20 amperes, when the conductors are run in an open loop as shown by Fig. No. 3, it could be contended with the advent of the 20

Fig. No. 3



Open loop
No. 14 overfused 5A
Connected load 40A



SAVE TIME

SAVE MATERIAL

SAVE MONEY

go Preformed

The Preformed Products shown above are establishing new service standards. Not only do they save countless man-hours of installation time, but also they assure a uniformity and efficiency of application unattainable by any comparable devices. They require no clips or clamps and can be installed easily by hand in most cases.

For complete details of their exclusive advantages, write or telephone Cleveland: EXpress 1-3571

PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVENUE, CLEVELAND 3, OHIO

ampere branch circuit that all of the small devices and cords connected thereto are considered as sufficiently protected by a 20-ampere fuse. Why is it then necessary to protect the No. 14 wire with a 15-ampere fuse when the circuit is arranged so that the load, not greater than 10 amperes, is connected to each branch and is limited by a 20-ampere fuse? The conductor load is limited and short circuit protection would be afforded by a 20-ampere fuse. This reasoning is similar to that now applied to motor branch circuits.

In reply to such a question, I would point out the distinction between the ordinary branch circuit and the motor branch circuit. The present requirements which permit the overfusing of motor circuit conductors is, in my opinion, not desired but it appears to be a practical solution for protecting a circuit which involves loads that have large current in-rush at the time of starting. Such characteristics justify overfusing in the case of motor circuits but the principle involved should not be extended to circuits which do not involve similar loads, and I do not agree that the reasons you have presented are sufficient to warrant such procedure.

I believe I realize the problems involved with selling adequate wiring especially when competition is a major factor in building construction. The fact remains, however, that past experience has proven time and time again that, if we do not obtain adequacy in our wiring designs of today, we may only look forward to a repetition of the evils which have constantly infested our wiring industry since the inception of the electric flat iron. Fire hazards due to overloaded and overfused wiring, inefficient operation, displeased customers, restricted markets for new appliances due to inadequate wiring, increased costs for modernization. This is the price we must eventually pay if we do not incorporate a generous "factor of adequacy" in our present wiring designs. The cost of such adequacy now will be insignificant with that involved later. The record over many years has proved this contention. It appears to me, as the average dwelling occupancy load continues to increase, that the days of the old 3-wire, single phase services are numbered. We have already reached the point where electric cooking, washing and ironing loads, coupled with air conditioning, warrant the installation of 3-phase, 4-wire services and extension in the use of higher voltages within the 150-volts to ground range, for serving many of our fixed appliances. When such services are generally available, many of your problems will be satisfied.—B.A.McD.

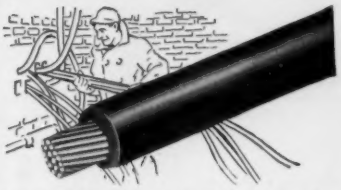
You're off to a good start with rugged neoprene-jacketed cable

Time is the best test of an installation job—and electrical contractors everywhere report that cable jacketed with Du Pont neoprene gives the long-term service their customers expect.

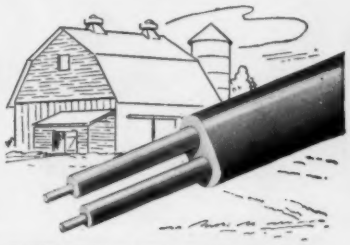
Neoprene gives cable round-the-calendar protection no other resilient material can offer . . . above ground, in ducts, or buried directly in the earth. Yet, tough as it is, neoprene is flexible and makes cable easy to handle. Your supplier will gladly tell you about neoprene-jacketed wire and cable—available in single- and multi-conductor types in a wide range of voltage ratings to meet your requirements.

FREE! The Neoprene Notebook. Stay abreast of the news on products of neoprene. On-the-job reports . . . interesting stories and case histories in every issue. Mail coupon to get on mailing list.

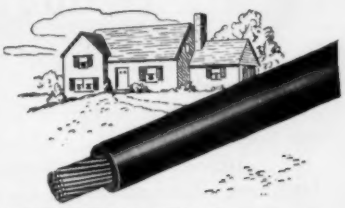
There's a neoprene-jacketed cable for every installation



POWER CABLE. Easy to "pull" in ducts and conduits, long-lasting in service—thanks to flexible neoprene jacket that resists abrasion, oil, grease, ozone and electrolytic action.



BARN WIRE. Tough neoprene jacketing protects wire against attack from corrosive fumes, ice and fungus around farm buildings. It's ideal for damp locations and barns.



WEATHERPROOF WIRE. Neoprene provides adequate dielectric strength plus a balance of physical properties to insure continuous service to home, factory, farm.

PORTABLE CABLE. For heavy-duty, mobile equipment. Sunlight, heat and weathering have little effect on durable neoprene covering. Withstands abrasion and flexing.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

MAIL THIS COUPON TODAY!

E. I. du Pont de Nemours & Co. (Inc.)
Rubber Chemicals Division EC-5
Wilmington 98, Delaware

Please put my name on the mailing list for the free "Neoprene Notebook."

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

When should a circuit breaker ... be a circuit maker?

Interruption of short circuits and overloads is but part of a circuit breaker's job.

Equally important is the task of keeping power flowing through the line . . . safely . . . without needless stoppages.

Here's how Heinemann Circuit Breakers serve better in *both* functions. When current in the line reaches or exceeds ten times rating, the Heinemann Circuit Breaker opens the circuit instantly . . . faster than any comparable device available today. On lesser overloads, it responds with precise, proportioned time delay, allowing for normal inrush and temporary, harmless overcurrents . . . thus preventing unnecessary service stoppages.

The hydraulic-magnetic operating principle further qualifies the Heinemann Circuit Breaker in its role as a better circuit *maker*. Because tripping points and current capacity remain constant regardless of ambient temperature, this principle permits safe use of full current capacity—summer and winter, in hot or cold locations—without de-rating or any form of temperature compensation. And, since no thermal elements are employed, nuisance interruptions due to ambient heat are eliminated.

Heinemann Circuit Breakers offer other advantages, too, in both convenience and economy. No reset is required. After a fault is cleared, service is restored simply by returning the handle to the ON position. And, because Heinemann Circuit Breakers have the lowest wattage loss, power is saved continuously throughout all the years of service.

INFORMATIVE LITERATURE AVAILABLE: For the straight facts, send for your copy of "What You Should Know About Circuit Breakers." Just ask for Manual 101.

HEINEMANN ELECTRIC COMPANY
132 Plum Street • Trenton 2, New Jersey

HEINEMANN Circuit breakers

Recessed Lighting

Q. *I have been asked to place some recessed lighting fixtures in a store building downtown and when I attempted to obtain a permit, the city inspector advised me he could not issue a permit for recessed lighting fixtures in that building because it was of bar joist construction. What code prohibits recessed lighting fixtures in such a building?*—M.C.A.

A. While this is not strictly a National Electrical Code problem, it is one with which a number of electrical contractors are being continually confronted and therefore is probably suitable for use in this column.

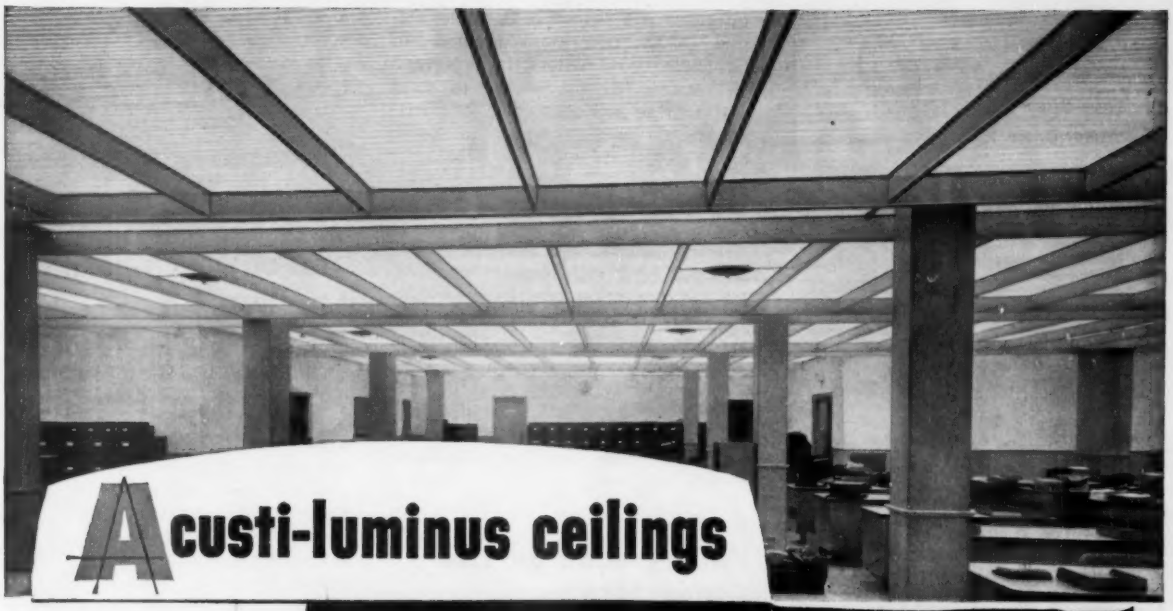
National building codes and many municipal ordinances require that buildings in the fire limits area of an individual city be of fire-resistive construction and in those buildings where steel is used for vertical or horizontal supports, these building ordinances require that that steel be protected against exposure from heat and fire by suitable fire-resistive material. Therefore, in a building using bar joists for the support of floors or roof, it is necessary that wire lath and plaster be placed below these bar joists to protect them from heat in the event of fire in the building and if openings were permitted through this wire lath and plaster, heat could, of course, reach the bar joists and bring about failure of the building within a relatively short time in the event of fire. Therefore, if recessed lighting is desired in such a building, it is necessary that a wire lath and plaster enclosure be built up and over the recessed space.

In your case the city inspector undoubtedly felt it would not be possible in an existing building to build such a wire lath and plaster enclosure up over the recessed space where you wished to place the fixtures and for that reason refused to issue a permit. Outlet or pull boxes not over 4-inch trade dimension may be placed in such a ceiling without having the wire lath and plaster over them, but larger boxes or cabinets are not permitted without having continuous wire lath and plaster over the boxes.—G.R.

Motor Feeder Lines

Q. *May motors be directly connected with rigid metal conduit or is flexible conduit required to be connected to the motor junction box to meet the requirements of the Code?* —M.W.R.

A. The Code does not specify either type of conduit, but by



Acusti-luminus ceilings

ABOVE—new general offices of the DORMEYER CORP., Chicago. This space was formerly an old loft cluttered with beams, pipes, ducts, and sprinklers. Now all these are hidden by the Acusti-Luminus Ceiling. CONTRACTOR: Kil-Bar Electric Co., Chicago.

offer you a complete "package" —with profit and protection!

INSTALLED BY LEADING FIRMS COAST TO COAST!

Here are a few of over 2800 installations in 37 states—in factories, offices, drafting rooms, critical work areas, stores, banks, schools, libraries, utilities, and public buildings:

American Airlines, Inc.
American Broadcasting Co.
American Cyanamid Co.
Boston Edison Co.
Chattanooga Power Co.
CBS (Television City)
Consolidated Vultee Aircraft Corp.
John Deere Co.
Douglas Aircraft Co., Inc.
Filene's of Boston
General Motors Corp.
National Broadcasting Co.
Republic Aviation Corp.
Trans World Airlines, Inc.
Union Carbide and Carbon Corp.
Zellerbach Paper Company

Here's the modern "ceiling of light" that puts profit back in lighting!

It's the Acusti-Luminus Ceiling—a complete "package" installation sold only on engineered quote. It's designed and guaranteed by the oldest company in the field.

You make the complete installation of both a *light* and a *ceiling* rolled into one—thus *doubling* your usual dollar volume. And you have full protection as the originator.

It's an ideal LIGHT—actually superior to daylight! The unbreakable corrugated Lumi-Plastic evenly diffuses the light, so there is *no shadow* and *no glare*—with low brightness of any intensity!

It's a streamlined CEILING! Hides pipes, cracks, ducts, and other old eyesores. Labeled by Underwriters' Laboratories for installation *under* sprinkler systems. In event of fire, the plastic (which does not support combustion) softens and falls to the floor so sprinklers function normally.

Reduces noise—distributes air! Noise-absorbing Acusti-Louvers may be hung below the Lumi-Plastic. And the plenum above may be used for low velocity distribution of conditioned air—through ⅛-inch air spaces —without the use of grilles or diffusers.

Installation is quick and easy! These lightweight units are simple to install in a minimum number of man-hours.

The cost is low—less than conventional ceilings with the same illumination and sound correction. Write or call today.

mail coupon for FREE BOOKLET!

NATION'S LEADING PRODUCER OF LUMINOUS CEILINGS

Luminous ceilings inc.

HOME OFFICE: 2500 W. NORTH AVE., CHICAGO 47, ILLINOIS

DISTRICT OFFICES

NEW YORK	CLEVELAND	LOS ANGELES	SAN FRANCISCO
BOSTON	WASHINGTON, D. C.	KANSAS CITY	SEATTLE
PHILADELPHIA	DETROIT	CHATTANOOGA	TULSA
PITTSBURGH	ST. LOUIS	SALT LAKE CITY	MONTREAL, CANADA

LUMINOUS CEILINGS INC.
2500 W. North Avenue
Dept. EC-5, Chicago 47, Ill.

Please rush me a copy of your FREE illustrated booklet giving more information about Acusti-Luminus Ceilings.

NAME_____
FIRM_____
TITLE_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

©LUMINOUS CEILINGS INC CHICAGO ILL 1954

Slash Motor Maintenance
Speed Installation
Increase Brush Life
Cut Motor Down Time

MULTIFLEX brushes with NEOPRENE pads

. . . really protect your motor and generator investments. Engineered for better contact and reduced vibrations, Helwig Multiflex brushes eliminate uneven wear and reduce circulating current. Get multiple brush operation without expensive changes. The key to longer commutator life is a quality brush designed to FIT, instead of a cut-down, so-called standard brush. Save production time and money with Helwig tailor-made brushes. Write for details on the Helwig brush inventory control plan.

HELWIG CO. CARBON PRODUCTS
2502 N. 30th Street
Milwaukee, Wisconsin

MINERALLAC
"PULL-IN"
COMPOUND
No. 100

LISTED and APPROVED by UNDERWRITERS LABORATORIES

For Rubber, Synthetic, Plastic or Lead-Covered Wires or Cables

Approved by Underwriters Laboratories for lubricating wires and cables to facilitate pulling them into conduits. Not injurious to wire or wire covers. Free of objectionable odors. White in color. Will not drip or run. Convenient pint, quart, ½ gal., gal. and 5 gal. cans. Available through your electrical jobber.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street, Chicago 7, Illinois

MINERALLAC

inference will permit both. Thus section 4439 covering "Method of Grounding" for motors, in paragraph "a" states, "If the wiring to fixed motor is in armored cable or metal raceways, junction boxes to house motor terminals shall be provided." In paragraph "b" of this same section, the Code provides for motor junction box being separated from the motor housing and using armored cable, armored cord, rigid conduit or EMT for the connection between the two.

In Article 500, flexible connections are recognized in Sections 5014, 5054 and 5072.

From a practical standpoint the flexible connection is the more desirable one in most cases due to the attendant vibration usually associated with motor installations.—B.Z.S.

Underground Service Conductors

Q. *Where underground conductors are buried directly in the earth as service to buildings or feeders between buildings and it is necessary to pass them under unpaved driveways, would you recommend the use of conduit over that portion of the cable located below the driveways?*—E.J.C.

A. Under Section 2311 of the National Electrical Code you will find the following: "Underground service conductors shall be protected against mechanical injury by being installed in duct, conduit, in cable of one or more conductors approved for the purpose, or by other approved means."

Then under Section 3102 b. you will find the following: "Cables of one or more conductors for direct burial in the earth shall be Type USE except that branch circuit and feeder cable may be Type UF. If single conductor cables are installed, all conductors of each service, feeder, subfeeder or branch circuit, including the neutral conductor, shall be run continuously in the same trench or raceway. Supplementary mechanical protection, such as a covering board, concrete pad, raceway, etc. may be required by the authority enforcing this code."

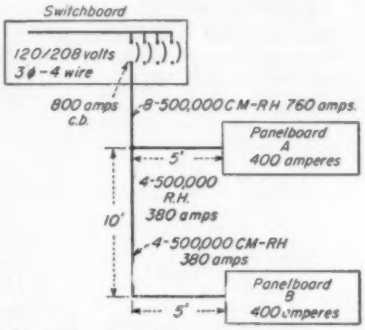
If these conductors are buried below frost, any of these methods will prove suitable; however, if they must be buried above the frost line, then we believe the covering board, which should consist of either a creosoted plank or other rigid board which will not disintegrate in the soil, is preferable to other types of protection due to the movement of the soil when it freezes and thaws. If conduit is used as an illustration, it would be perfectly possible for one end to be frozen solidly and for the other end of the conduit to be in thawed earth at certain times of the year and where that condition occurs, you are likely to be subject to a buckling of the pipe which will eventually destroy the insulation and possibly even the conductors themselves.—G.R.

Panelboard Protection

Q. *The September 1953 issue of "Electrical Construction and Maintenance" carried a section entitled "Code Revisions, 1953". The presentation of the Code Revisions, including the panel and personal comments, was certainly well done.*

At this time, I am especially interested in a change made to Section 3882 by the new Section 3883 which limits the necessity of protecting a panelboard supplied by conductors having overcurrent protection greater than 200 amperes to a lighting or appliance branch circuit panelboard.

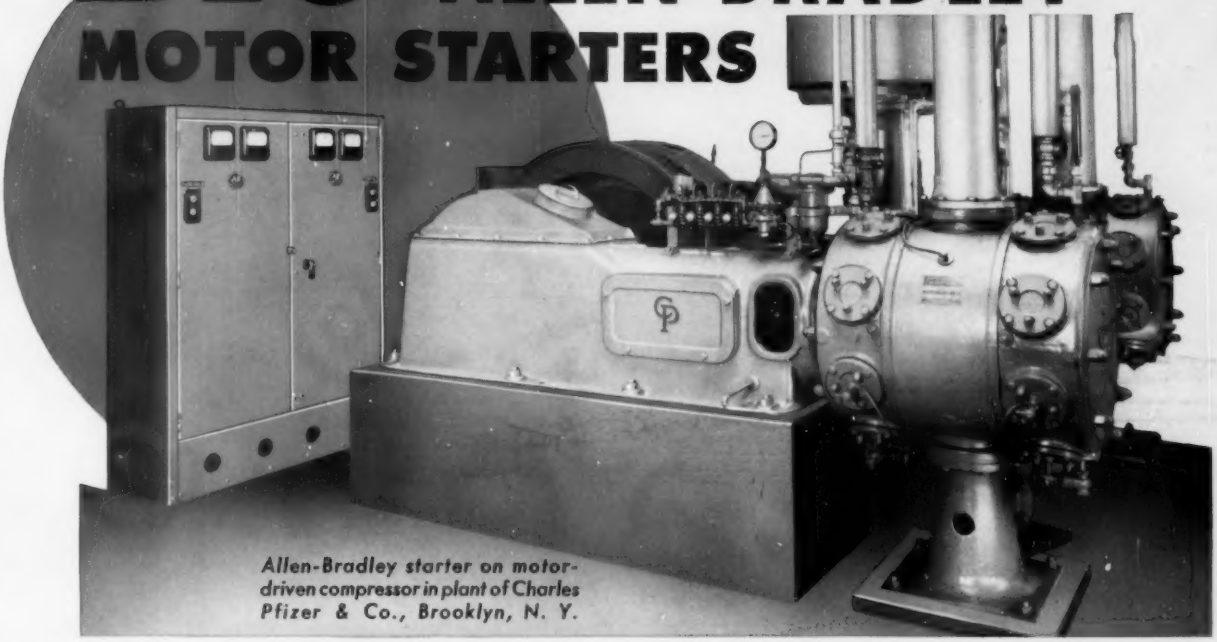
Assuming that we have two power or distribution panelboards with main bus rated at 400 amperes fed from an 800-amp circuit breaker in a switchboard, as indicated in the accompanying sketch; would main overcurrent protection be required for either panelboard A or B?—F.X.H.



Current-Carrying Capacity
1-500,000 RH-380 amps.
2-500,000 RH-760 amps. subject to penalty if applicable

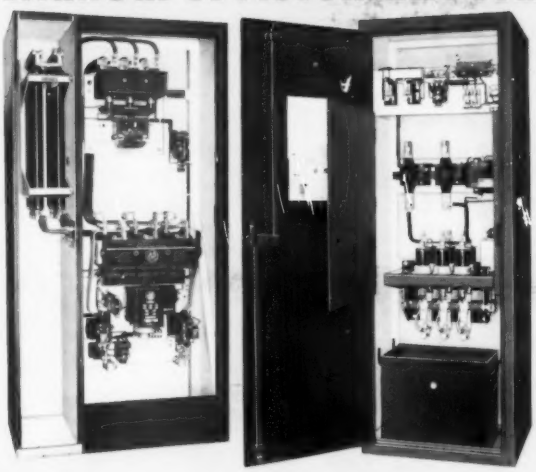
A. According to the new provisions of Section 3883 which covers the overcurrent protection of panelboards, I am unable to find any Code violation with the diagram you have submitted, provided the two 400-ampere panels shown are not, in either case, a lighting and appliance branch circuit panelboard as defined in Section 3881. This comment applies only to the panelboard protection. If, however, either panelboard has more than 10% of its overcurrent devices rated 30 amperes or less for which neutral connections are provided, there would be a Code violation since it would then be classified as a lighting and appli-

BIG ALLEN-BRADLEY MOTOR STARTERS



Allen-Bradley starter on motor-driven compressor in plant of Charles Pfizer & Co., Brooklyn, N. Y.

Manual or Automatic Starters Up to 1500 HP-4600 V



Bulletin 740 Size 6 resistance starter with adjustable graphite disc compression resistors.

Bulletin 1109 high voltage across-the-line squirrel cage automatic motor starter. Has 3-pole oil immersed contactor.

BIG MOTORS need dependable starters with trouble-free contactors, relays, and current limiting fuses or circuit breakers. To meet the demands of large motor-driven machines, Allen-Bradley has developed a line of 14 different types of across-the-line and reduced voltage starters . . . for motors up to 1500 hp.

Each type comes in a wide range of horsepower and voltage ratings . . . either manually or push button operated. Every big Allen-Bradley starter consists of time-tested components that have established their individual reputations for quality and trouble-free performance.

At maximum rating, these big starters have an interrupting capacity of 10 times motor full load current. These starters are designed to be self-protecting against short circuits up to 150,000 kva on 2000-2500 volts or 250,000 kva on 2501-4600 volts.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

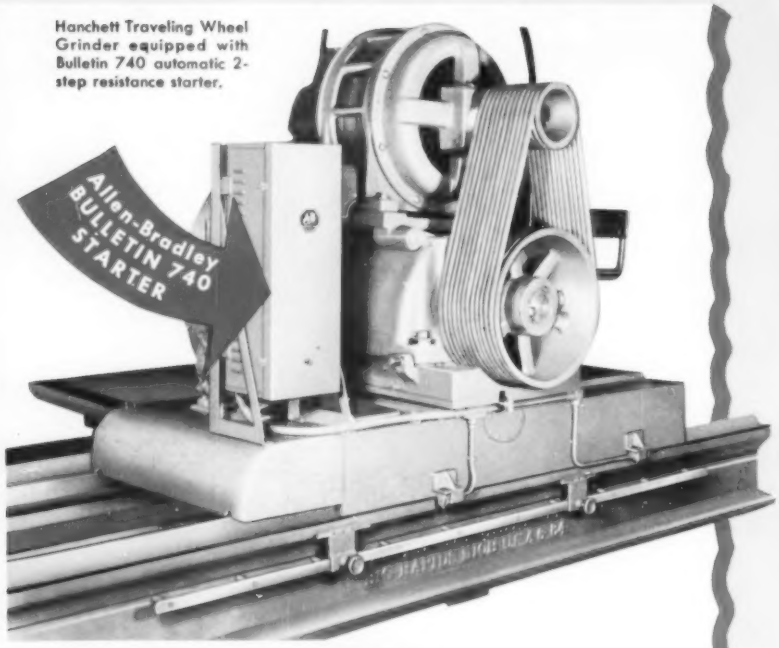
Overload Protection—Two thermal relays provide reliable and accurate overload protection. Always accurate . . . always on the job.

Out-of-Step Relay—The squirrel cage winding of synchronous motors is provided for starting only, and is susceptible to injury through overheating if the motor operates at subsynchronous speed for more than the safe allowable starting time. An out-of-step relay is therefore provided on all A-B synchronous motor starters. The relay is a fluid dashpot type of time delay overload relay.

5-54-M

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

When You Need a Reduced Voltage Starter



Hanchett Traveling Wheel Grinder equipped with Bulletin 740 automatic 2-step resistance starter.

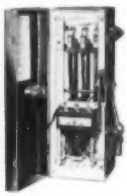
Here Are 6 Allen-Bradley Starters . . . All Different

To satisfy the varied starting requirements where a reduced voltage starter is either necessary or desirable, 6 types of Allen-Bradley reduced voltage starters are listed here. They will start spinning frames, big presses with heavy flywheels, and chain or gear driven machines without jerk or jolt. For more complete data, please send for Allen-Bradley Handy Catalog—6th Edition.

Rear view of Bulletin 640 manual compression resistance starter (removed from cabinet) showing 3 resistor tubes that are filled with graphite discs. Pressure is gradually applied on discs with hand lever which lowers the starting resistance until the motor and the machine accelerate with velvet smoothness.

MANUAL—COMPRESSION TYPE

Manual compression resistance starter up to 200 hp, 220-440-550v. Graphite discs in the insulated tubes are compressed with the hand lever for stepless speed control. Ideal starters for chain or belt drives. Overload relay protection.



BULLETIN 640

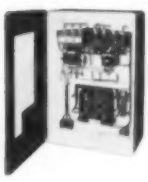
MANUAL—TRANSFORMER TYPE

Manual transformer type starter up to 125 hp, 220v; 250 hp, 440-550v. Air break or oil immersed contacts. Automatic reset overload relays. Time delay mechanism determines proper time interval for manual switch-over of hand lever.

BULLETIN 646

AUTOMATIC—TRANSFORMER TYPE

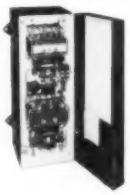
Automatic reduced voltage starter up to 300 hp, 220v; 600 hp, 440-550v. Timing relay controls the accelerating time. Operator touches Start button—the starter does the rest. Available in standard, watertight, and dusttight enclosures.



BULLETIN 746

AUTOMATIC—2 & 3 STEP COMPRESSION

Automatic resistance starter with preset adjustable graphite resistors up to 200 hp, 220-440-550v. Push button closes starting circuit through resistors. Later, timing relay closes running contactor and cuts out the starting resistors.



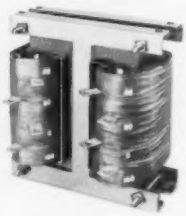
BULLETIN 740

AUTOMATIC—STEPLESS TYPE

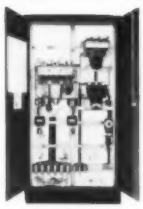
Fully automatic resistance starter with solenoid controlled graphite disc resistors up to 300 hp, 220v; 600 hp, 440-550v. Stepless control of current and speed. Acceleration adjustable to avoid lamp flicker. Overload relay protection.

BULLETIN 742

Autotransformer with 50, 65, and 80% reduced voltage taps used in Bulletins 646 and 746 autotransformer type starters.



AUTOMATIC—MULTI-POINT



Automatic resistance starter up to 300 hp, 220v; 600 hp, 440-550v. Resistors easily adjusted for ideal starting of motors on power networks. For more than 4-point control, use Bulletin 742 starter.

BULLETIN 741

A-B Quality

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY
REDUCED VOLTAGE STARTERS
QUALITY

5-54-M

ance branch circuit panelboard and as such, it must be protected by 400-ampere overcurrent devices. Since your diagram shows the neutral conductor of the three phase WYE system entering each panelboard, it is quite possible that this factor is involved with the answer to your question.

In order to clarify my opinion on this question, I have shown under Fig. No. 2 an 8-circuit, 3-phase panel which contains a neutral bar for the purpose of making a connection to the neutral. Circuits 1, 2, 3, 5 and 6 are 3-phase, 3-wire circuits protected by over-current devices in excess of 30 amperes. They are 3-phase power circuits and are not involved. Circuit No. 4 is 3-phase, 4-wire, 60-ampere, used to protect a feeder supplying a 3-phase lighting panel. This also is a power circuit. Circuit No. 7 is a 3-phase, 3-wire, 30-ampere circuit supplying a motor. This also is a power circuit which does not involve the use of the neutral and in my opinion should not be considered in determining the status of the panel. Circuit No. 8 however is a 3-phase, 4-wire circuit with 30-ampere or less overcurrent devices which is used to supply a lighting and appliance load. It appears to me that this circuit should be the basis for determining the status of the panel. As shown in the note under Fig. No. 2, we have in this example a panel which

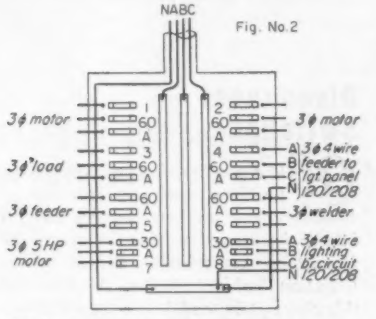


Fig. No. 2

Total no. overcurrent devices in panel-24
Overcurrent devices 30 amps. or less with neutral—3
10% of 24 = 24 overcurrent devices. 12.5% x 24 = 3
Under the above conditions this panelboard contains 3 overcurrent devices, rated 30 amperes or less with provisions for neutral connections which is in excess of 10% of the total number of overcurrent devices. It is therefore rated as a 'Lighting and Appliance Branch Circuit Panelboard' and must be protected.

contains a total of 24 overcurrent devices. Three of these overcurrent devices are rated 30 amperes or less and provisions have been made for a neutral connection. According to Section 3881, these three overcurrent devices exceed 10% of the total number of overcurrent devices in the panel. As a result the panel would be rated as a lighting and appliance branch circuit panelboard.

It appears to me, from the foregoing, when panelboards of a combination type are designed, involving the use of neutral conductors and 30-ampere overcurrent devices, that few will qualify as power panels and as a result must have the protection covered by Section 3883. Since your question does not cover this important point, a definite answer may not be given. I do note, however, on your diagram that the 15-foot tap which runs to Panel B would be in violation of Section 2434-d of the Code unless it terminated in a breaker or set of fuses which will limit the load on the tap, in the case shown, to 400 amperes. The 5-foot tap to Panel A also may be involved with a violation unless all of the provisions of Section 2434-c are satisfied.—B.A.McD.

Grounding Portable Equipment

Q. *There was a fatal accident some years ago on a coal conveyor in one of the local coal yards. I believe the voltage was 440, also 60 cycles, 3-phase.*

I have said that this accident could have been prevented, if the cable and perhaps the switch was of proper design, say a 4-wire rubber cable and a magnetic switch. When trouble developed the switch would open all three phases of line. The coal conveyor was being moved to a new location and cable was cut (all but the third wire) and the insulation was ruptured, and if was this part of the cable that the man picked up and was responsible for his death. I want to ask if there is a provision in the code that would cover a wiring job of this kind? If so please state. —A.C.S.

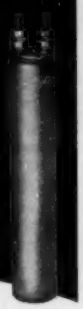
A. Section 2545 of the Code requires exposed non-current carrying metal parts of portable equipment to be grounded if it is operated at more than 150 volts to ground, except:

1. portable equipment which uses a guarded motor; i.e., the motor is so arranged that contact cannot be made with the motor.

2. portable equipment consisting of electrically heated appliances which cannot have its metal frames grounded and the local inspection authority grants special permission (usually written), to have such frames permanently and effectively insulated from the ground.

Section 2559 provides three methods for providing the proper grounding of these non-current-carrying metal parts of portable equipment. One of these methods does provide for the use of a 4-wire cable as you indicate in your question.

Your LOW COST SOLUTION to PROCESS HEAT problems

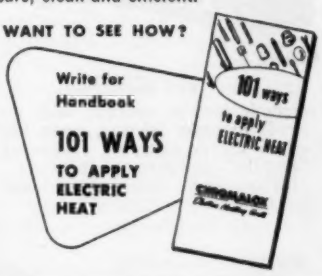


Save time and money with economical, easy-to-install

CHROMALOX *Electric* UNITS

Only Chromalox gives you a full selection of electric heaters to meet every need. Over 15,000 types, sizes and ratings to choose from, most available from stock—for heating gases, liquids, platens, dies, molds, ovens, soft metals and countless other materials. Chromalox Heaters are easily and inexpensively installed, provide concentrated, controlled heat that is dependable, economical, safe, clean and efficient.

WANT TO SEE HOW?



19-32-A

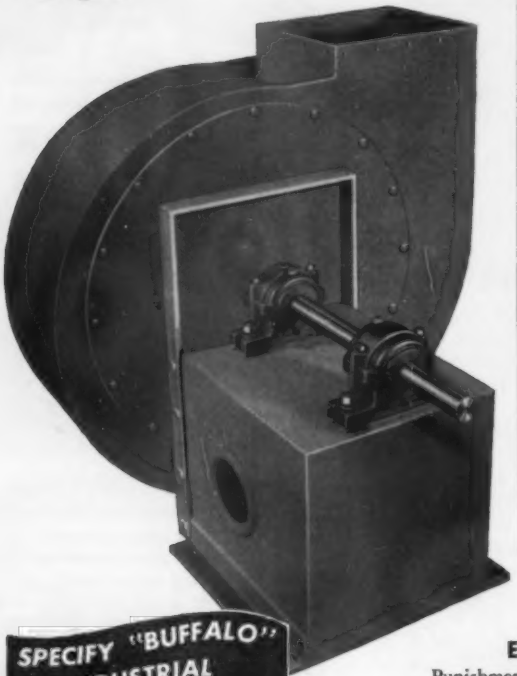
EDWIN L. WIEGAND CO., Industrial Division
7637 THOMAS BLVD., PITTSBURGH 8, PA.

Send me the illustrated booklet "101 Ways To Apply Electric Heat."

Name_____
Company_____
Street_____
City_____ Zone____
State_____
I use heat for_____

CHROMALOX
THE BEST IN ELECTRIC HEAT

Here's Why the USERS appreciate "Buffalo" INDUSTRIAL EXHAUSTERS



Chemical and process plant men

Flour, feed and grain processors

Factory maintenance men

Brick and ceramic operators

General plant engineers

SPECIFY "BUFFALO" INDUSTRIAL EXHAUSTERS

EFFICIENCY

Smooth interior surfaces with no rivet heads to cause friction, mean high efficiency air or materials exhausting with "Buffalo" Industrial Exhausters. This, plus easy maintenance, means lower operating cost.

ENDURANCE

Punishment-proof construction includes all-welded, heavy steel plate housings and rotors; oversize shafts and bearings to take continuous gas exhaust or materials conveying service.

MODELS FOR EVERY JOB

"Buffalo" Exhausters are built in models for high temperatures, corrosive fumes, erosive or stringy materials—even forced draft applications.

WRITE TODAY FOR BULLETIN 3567

Right, Type "AW" Air Wheel

Far Right, Type "MW" Material Wheel

BUFFALO FORGE COMPANY

520 Broadway Buffalo, New York

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

Panel Breezo Fans • Belted Vent Sets • Belt-Air Fans

Breez-Air Attic Fans • "L" Breezo Fans • "NV" Breezo Fans

However in this particular case I cannot see wherein proper grounding would have definitely avoided the accident. It is true that had proper grounding been made, a defective cord might have caused a "short to ground" rather than have left a hot wire exposed. It is just as likely and as possible for only one hot wire to be left exposed due to ruptured insulation without having any deterioration in the other conductor insulation. A covered grounding conductor with its insulation intact would offer no protection in this particular case. A bare grounding conductor may offer some protection but here again the chances would be slight unless the hot conductor insulation would have deteriorated to such an extent as to permit definite contact with the grounding conductor.

Then again, if the wire were cut loose, as indicated in your statement, it would have been possible for the same conditions to exist as you described, even with a grounding conductor, since it would still be possible for carelessness to take over as it seems to have done in this case. In other words, it would have been possible to cut loose two hot legs and the grounding conductor and still not cut away the one hot leg with the bad insulation.

This fatal accident in my opinion, from the meager facts presented, was due more to careless supervision and maintenance rather than to any specific code violation.—B.Z.S.

Disconnect Switches

Q. *We are wiring a three-story building and are placing a 400-ampere main line service switch in the basement of this building and from there we wish to run to a distribution cabinet for each floor of this three-story and basement building. The distribution cabinets in the basement and on the third floor will be only four circuit panels while the panel on the first and second floors will be much larger, with the first floor panel having approximately 200 amperes connected load and the second floor panel about 100 amperes connected load. Must we provide a fuse disconnect in the feeders extending from the main line switch to each of these four panels?*—N.J.M.

A. Disconnect switches are not required by the Code for the feeders between the main line service and the distribution panels. However, overcurrent protective devices are required with the following exceptions:

For your panel in the basement, if this panel can be kept within 5 feet of the main line disconnect, no overcur-

rent protection is required; and if the distribution panel for the first floor requires less than 25 feet of feeder conductor to reach it from the main line, it too would require no overcurrent protection, inasmuch as feeders capable of supplying 200 amperes for the load of this panel would have a carrying capacity of more than one-third the carrying capacity of the service equipment. Rules governing these two conditions will be found under paragraphs c. and d. of Section 2434 of the National Electrical Code. However, if use is made of this rule, then it is necessary to refer to Section 3883 where you will note that a panelboard supplied by conductors having overcurrent protection greater than 200 amperes shall be protected on the supply side by overcurrent devices having a rating not greater than that of the panelboard. In other words, the 60-ampere board in the basement if the feeders are unprotected between the main line and the board will have to have 60-ampere or smaller overcurrent protective devices on the panelboard. The same is true of the 200-ampere panel on the first floor. Then, inasmuch as the panel on second floor will, in all probability, be more than 25 feet from the main line disconnect and the panel on third floor will without question be more than 25 feet distant, it will probably be to your advantage to provide overcurrent protection at the main line disconnect location for each of the feeders to each of these panels.—G.R.

Seals in Hazardous Locations

Q. *In hazardous locations are seals required both at the motor end and at the disconnect switch located in the hazardous area or will one seal at the disconnect switch meet the requirements of the Code?*—M.W.R.

A. In general two seals will be required. However, motors for use in hazardous locations must be approved for Class I, Division 1; 5058 requires Class I (explosion-proof) approved for Class I, Division 1; 5058 requires Class II approval for Class II, Division I, etc.

Many of these approved motors will have seals incorporated into their design so that the second seal at the motor will not be required.

The main purpose of sealing should be kept in mind. If the explosive gases within a motor are definitely confined with the motor shell when they are ignited, and do not escape into the motor conduit system then sealing is not required.—B.Z.S.

BIDDLE *Instrument News*

NEW PRODUCT

Biddle Motor Rotation and Phase Tester

(Dual Purpose)

With it you can

- ***Determine*** **the direction of rotation of electric motors before they are connected to the line.**
- ***Determine*** **the phase rotation or sequence of energized power circuits.**

Here is a positive means for determining which motor leads must be connected to certain conductors of a supply system to insure that the motor will rotate in a prescribed direction when energized.

This device will permit the electrical contractor or industrial maintenance electrician to permanently connect and tape the terminals of the motor being installed, without having to first energize the motor by a temporary "hook-up" from a power source, if available, to determine its rotation.

The Biddle Motor Rotation and Phase Tester eliminates the need for temporary connections which can be time consuming, costly, and quite hazardous, particularly where many large high-voltage motors are involved.

Certain types of drives should not be moved even a few degrees in the wrong direction. In such cases the temporary "hook-up" or trial method, having a fifty-fifty chance of being wrong, can do serious harm.

Even in the case of new motors with tagged leads, there is the possibility of human error in attaching the lead markers or of their becoming detached in shipment.

Incidentally, there are two other important uses for this unique testing device. It can determine the polarity of power and instrument transformers, and it can be used as a continuity tester in checking electrical circuits.

Housed in a sturdy oak case 12¼ in. x 8¼ in. x 4¼ in. this compact unit weighs approximately 10 pounds and is supplied complete with 3 line and 3 motor leads which store in the compartments either side of the instrument panel.

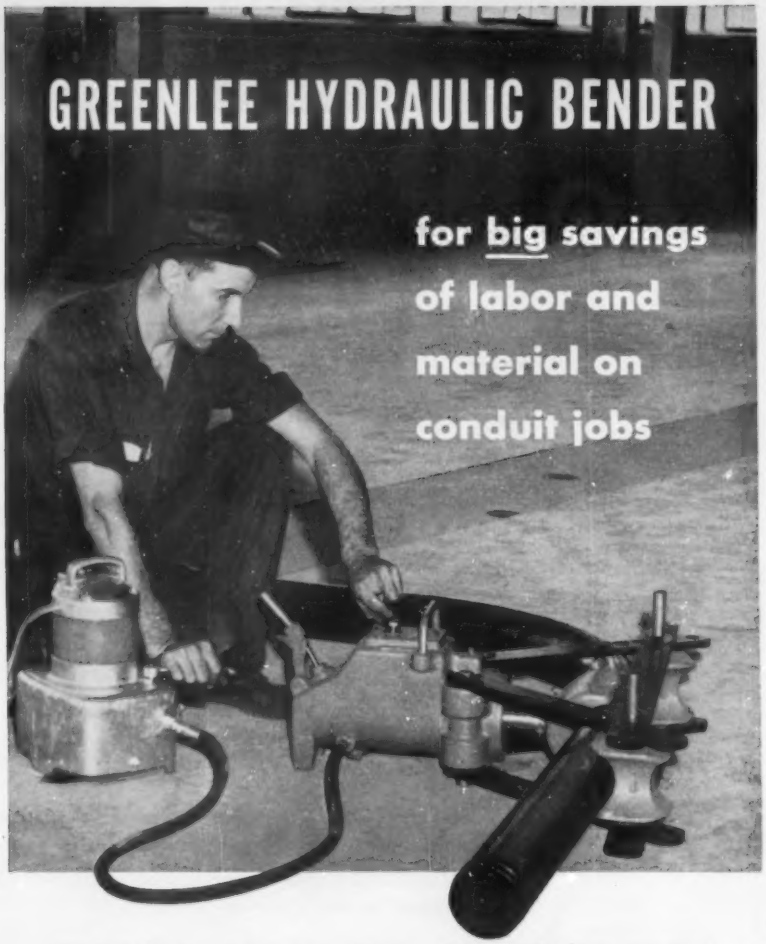
For complete details write for ***Bulletin 80-ECM***

8-410

JAMES G. BIDDLE CO.

• ELECTRICAL TESTING INSTRUMENTS
• SPEED MEASURING INSTRUMENTS
• LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.



extra fast, easy operation with portable power pump

Here's the combination that's making many a conduit installation job move along far faster today — a portable GREENLEE Hydraulic Conduit Bender *plus* a handy power pump.

Neat, tailor-made bends result every time with a GREENLEE Bender. Owners report remarkable labor savings — ranging from 50% to 90%. And the cost of many manufactured bends and fittings is entirely eliminated.

With the GREENLEE, *one man* in but a few minutes makes smooth, *accurate* bends in pipe up to 5", rigid and thin-wall conduit, tubing, bus bars. Compact, portable — for *on-the-job* bending exactly where and when wanted. Often pays for itself on the very first job. Two models. Portable power pump, built especially for GREENLEE Benders, lets you put your bending on a fast, "production line" basis. Has built-in ½-H.P., 110-volt single-phase electric motor with sealed, permanently lubricated bearings. Delivers intermittent pressure up to 9,000-10,000 lbs., continuous pressure of 5,000 lbs. Easy to move with Bender from job to job.

Let this highly efficient, powerful bending equipment help you speed work, save materials, get better overall results on your next conduit job. Write for details. Greenlee Tool Co., 1745 Columbia Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN
GREENLEE

OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK

Hand Benders • Knockout Tools • Auger Bits and Drills • Cable Pullers • And Many More

Motor Circuits

Q. *We are wiring a number of machines which are powered by two 440-volt motors, one 7½ hp and the other 10 hp, with the control equipment and disconnecting switches mounted on a panel at a few feet distant from each machine. After connecting the first machine, we were advised that our method was in violation of the Code as we placed 12 control conductors and the six circuit conductors all within a 1½-inch conduit between the control panel and the machine. As the full load current of the 7½-hp motor is 11 amperes and 14 amperes for the 10-hp motor, we used No. 14 TW conductors for the smaller motor and No. 12 TW conductors for the larger motor; and the 12 control conductors were all No. 14 TW and operate at 110 volts, this voltage being derived through a small transformer from the 440-volt feeder supplying the control panel. Is it true that the Code will require there be two conduits between this panel and the machine with the motor circuit conductors for one motor and the control conductors for that motor contained within each conduit?*—M.G.

A. No. The Code does not require separate conduits for the individual motor circuits and their controllers. However, it is true some inspectors misinterpret the last sentence of Section 3011, which reads as follows: "Control, relay and ammeter conductors used in connection with any motor or starter may occupy the same enclosure as the motor circuit conductors." This is unfortunate as the Code does not intend to place this limitation on the conductors within a common raceway as all conductors of light and power systems of 600 volts or less may occupy the same enclosure without regard to whether the individual circuits are alternating current or direct current if all conductors are insulated for the maximum voltage of any conductor within the enclosure.

Then under Section 7265 you will find the following: "The number of conductors of remote-control or signal circuits in a raceway may be determined according to Tables 4 or 9 of Chapter 10; and Note 4 of Table 1 need not be observed. Where there are four or more conductors in a raceway, some of which are remote-control, as permitted by Section 3011, the provisions of note 4 following Tables 1 and 2 of Chapter 10 shall apply, as determined by the number of power and lighting circuit conductors only."

Therefore, in your case you are in compliance with the Code except for the fact you have neglected to derate the current carrying capacity of the

motor circuit conductors as required where six conductors are contained within a common enclosure. This would make it necessary for you to use No. 12 conductors for the smaller motor and No. 10 conductors for the larger motor. This might be most easily accomplished by substituting three No. 10's for the three No. 14's now in use and this can be done without increasing the conduit size as the cross-sectional area of a 1½-inch conduit is ample to take care of the additional cross-sectional area of the larger motor circuit conductors. In determining any conduit fill regardless of the use of conductors, it is, of course, necessary to comply with Table No. 11, which limits us to a 40% fill where four or more conductors are installed. —G.R.

Grounding Switch Housing

Q. *On a farm job, I have been called for not grounding the control switch for a one horsepower motor which drives the barn cleaner. Inasmuch as this switch does not operate at more than 150 volts to ground, I saw no reason for grounding the switch housing even though it is supplied by barn wire. Is this a requirement of the Code or is it the inspector's idea?*—L.S.

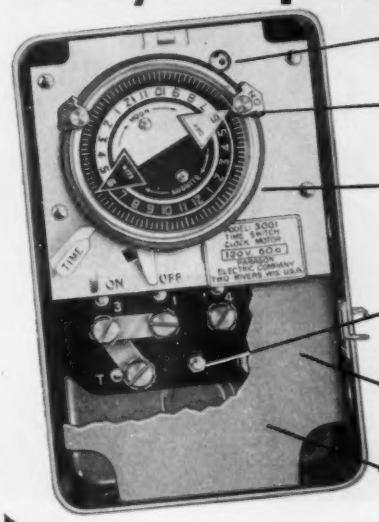
A. Under Section 4438 of the Code, you will note that controller cases, except those attached to ungrounded portable equipment and except the lined covers of snap switches, shall be grounded regardless of voltage. Therefore, if you have used a small enclosed switch as the controller for this one horsepower motor, the Code will require it be grounded. —G.R.

Lighting Fixtures

Q. *Where in the Code will I find the rule governing the distance required between ungrounded metal lighting fixtures and water pipes and other conductive surfaces?*

A. That rule requiring a spacing between ungrounded metal lighting fixtures, lamp-holders, and face plates is found under Section 4215 of the Code and provides that such conductive surfaces shall not be within 8 feet vertically or 5 feet horizontally of laundry tubs, bath tubs, shower baths, plumbing fixtures, steam pipes or other grounded metal work or grounded surfaces.—G.R.

The PARAGON
"Memory Master" time switch is
100% Dependable



INSTANT CHECK of motor operations through Moto-Vu operating window.

INSTANT ADJUSTMENT—add or remove quick-change dial trippers any time without removing dial.

"TORSION-CLUTCH" DIAL DRIVE — dial turns freely for manual check of "on-off" switch operations . . . yet has positive, no-slip drive.

"QUICK-OUT MOVEMENT" positively locks in case. Rattle-proof. Movement swings out when unlocked. No loose parts.

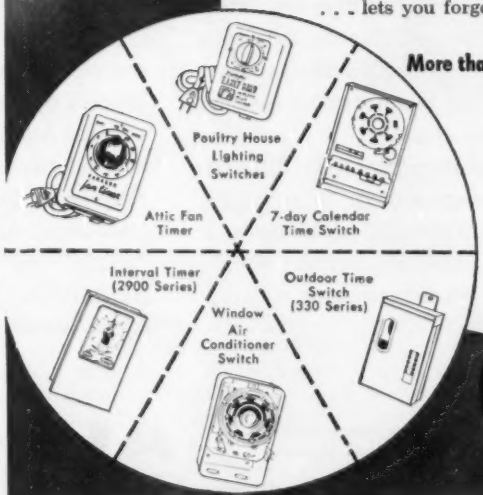
SIMPLIFIED HOOK UP — with new easy-access terminal block.

FULL-DEPTH TERMINAL BLOCK INSULATOR PLATE.

from $10.50 list

. . . used wherever a 24-hour ON-OFF time switch is needed

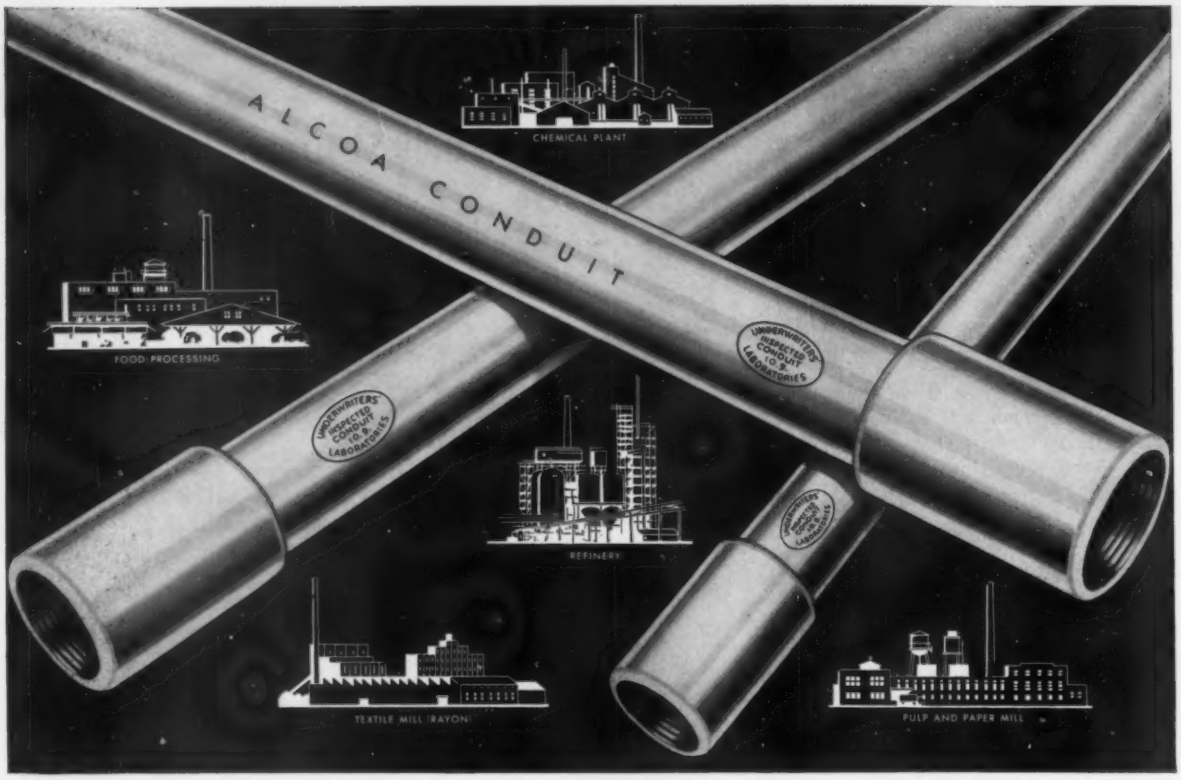
Men in the electrical field are unanimous in their praise of the new 3000 Series Memory Master. It is 100% dependable for controlling "ON-OFF" operation of bill board lights, store illumination, poultry house lighting, stoker operation and hundreds of other plant applications. It's the switch that remembers . . . lets you forget.


Poultry House Lighting Switches
Attic Fan Timer
7-day Calendar Time Switch
Interval Timer (2900 Series)
Outdoor Time Switch (330 Series)
Window Air Conditioner Switch

More than 40 time switches available

Check Paragon's catalog the next time you need a time control. Paragon's complete line of 24-hour, 7-day, indoor and outdoor time switches — including industrial timers — makes your choice easy. For your personal copy of Paragon's latest catalog write Dept. 1614.

PARAGON ELECTRIC COMPANY
TWO RIVERS, WISCONSIN



The Lowest Cost Corrosion Resistant Conduit for Plants Like These is ALCOA ALUMINUM RIGID CONDUIT

Alcoa® Aluminum Rigid Conduit, especially resistant to industrial atmospheres that often attack other metals, costs less than any other corrosion resistant conduit. The excellent performance of aluminum conduit in corrosive conditions means lower maintenance costs and less frequent replacement.

In addition, Alcoa Aluminum Rigid Conduit is nonmagnetic, lowers voltage drop, eliminates overcrowding of terminal enclosures and simplifies the installation of electrical equipment having widely spaced terminals.

Alcoa Aluminum Rigid Conduit reduces handling, fabricating and installation costs. It is only about one-third the weight of the same size in steel. A 10′ length of the 4″ size weighs only 33 pounds and can easily be handled by one man.

Alcoa Aluminum Rigid Conduit is approved by Underwriters' Laboratories, Inc. and each piece bears their label. Readily available. Call your local Alcoa sales office, listed under "Aluminum" in your classified directory. ALUMINUM COMPANY OF AMERICA, 2108-E Alcoa Building, Pittsburgh 19, Pennsylvania.

For complete information write for Alcoa's new booklet, *Alcoa Aluminum Electrical Rigid Conduit.*

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

In The News

Industry Conference Draws Minn. Contractors

Electrical contractors and inspectors from Minnesota, North Dakota and portions of South Dakota comprised about 30 percent of the 1,000 electrical industry representatives officially registered at the recent Upper Midwest Electrical Industry Convention and Electrical Trade Exposition at St. Paul, Minnesota. This annual conference of eight electrical trade groups was again coordinated through the North Central Electrical Industries. The Biennial Electrical Trade Exposition was sponsored by the North Central Electrical Manufacturers' Club, Inc.

As in the past, each trade group held its own conference covering subjects pertinent to its specific field of operation. All-industry luncheon and evening sessions were open to interested delegates, as was the huge trade show in the St. Paul Auditorium.

On the convention agenda was the 26th Annual Meeting of the Minnesota Electrical Association, Inc.,—an organization of more than 250 electrical contractors located outside the Twin-Cities area. Retiring president R. J. Slafer of Mankato revealed that the association has taken over the assets of the recently dissolved Midwest Electrical Council, Inc., and will continue distribution of forms, books, manuals and services formerly performed by the Council. In addition, MEA has instituted a research program on accounting in cooperation with the University of Minnesota School of Business. Plans are for this to develop eventually into a Business Administration Program for electrical contractors, a natural outgrowth of a series of estimating short courses sponsored by the association.

MEA by-laws were amended at the meeting to permit larger area representation. There are now 18 members on the Board of Directors—two from each of nine geographical regions. While this is a Minnesota organization, its articles of incorporation permit interested electrical contractors from adjoining states as members if they become part of the geographical district nearest their sphere of operations.

Following his annual report, secretary Wm. A. Ritt, St. Peter, emphatically reminded MEA members that the major market potential and opportunity now lies in electrical modernization—in the home, farm, institution, commercial building and industrial structures. He specifically noted that store owners agree that they must remodel every 10 years to maintain their competitive standing in the community. Interest in apprenticeship training continued with 26 applications last year. Since 1946 some 403 apprentices have been registered under the MEA program, Ritt noted.

New MEA officers elected at the close of the session included: President—Francis Judge, Worthington; vice president—Erle M. Mitchell, Duluth; secretary—Wm. A. Ritt, St. Peter; treasurer—Elroy Lehn, Anoka. Carl Birk of Litchfield, Minn., was appointed manager to succeed Sheldon Beanblossom who resigned last December. Mr. Birk has been a sales supervisor for the Standard Oil Company for the past 12 years.

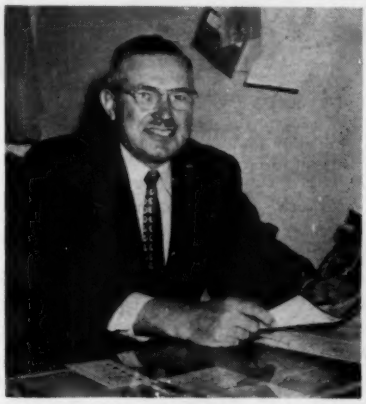
At the annual meeting of the Minnesota Electrical Inspectors Association, the following officers were elected: President—John A. Warkentin, Mountain Lake; vice president—R. F. Lloyd, Minneapolis; secretary—Glenn Rowell, Minneapolis; assistant secretary—Stan Sayre, St. Paul.

Speaking at the Wiring Codes Meeting and at the Electrical Contractors Forum, Sam Rosch, consulting engineer, Anaconda Wire & Cable Company, New York, warned contractors and inspectors that electrical construction and inspection problems are becoming more complex as the industry progresses and chemical research develops new materials. Because natural materials and metals are being depleted, new synthetic materials must be made, he added, noting that last year 80 percent of all branch circuit wiring was thermoplastic insulated. Rosch is convinced that 13.8 kv is the distribution voltage of the future; that aluminum cables will find greater application on a larger scale in the future (more basic aluminum ore than copper available in earth's crust); that future editions of the National Electrical Code will be much larger volumes; that contractors should learn about new materials as they appear on the market and learn how to install them.

Mr. Rosch told the group he intends to introduce new Code tables for the carrying capacity of insulated aluminum conductors; also additional reduction factors for more than nine conductors (copper) in a raceway, particularly for troughs and racks which now take up to 30 or more large cables. Contractors perked up when Rosch predicted that if use of electricity continues at the present rate, in the next 10 years we will need as much cable as was used in the past 75 years.

Among the problems facing the electrical construction industry, as outlined by E. R. Cornish, director of research, NECA, are the following: highly competitive bidding on firm contract work (getting worse in some

MAKING PLANS for the April Spring Fair of the San Diego Bureau of Home Appliances, and celebration of Light's Diamond Jubilee are C. J. Burce, Coordinator of Electrical Contractors' Division, talking over details with J. Clark Chamberlain, Secretary-Manager, both of the Bureau of Home Appliances of San Diego County, California. Burce has promise of several San Diego electrical contractors to participate in EC&M's 1954 Light's Diamond Jubilee Lighting Competition for Electrical Contractors.



ELECTRICAL CONSTRUCTION work in Southern California aircraft and electronics plants continues good in 1954, keeps Oscar Lundberg of Capitol Electric Co., San Diego, both busy and happy. He had just closed a large commercial rewiring job the morning this picture was taken.

"Why do so MANY people decide on

NIAGARA TRANSFORMERS?"

Is it the reputation for reliability that Erie has earned over the years? Is it the dependable way that every Niagara Transformer has performed? Is it the fact that delivery promises are commitments that we take seriously? Yes, these are all important reasons why people all over the world come back again and again for Niagara Transformers.

BUT . . . there's a hidden plus value that makes all this possible. It's the ATTITUDE of the people here at Erie Electric that actually build the transformers. These men grew up in the transformer business and their pride in their workmanship, we believe, is rare these days. They just *won't* let a shoddy piece of work slip by. That's a plus value that doesn't increase your price but it sure increases the reliability of your transformer. Make sure that Erie Electric quotes on *your* next transformer.

NIAGARA 500 KVA, 60 cycle, single phase, 2400/4160Y - 240 x 480 volt oil-immersed self-cooled transformer conforming to EEI-NEMA 5th report.

Send for this **FREE BOOK!**

Get acquainted with all the plus values in a Niagara Transformer. Write on your letterhead for this big, fully illustrated and informative book.

ERIE ELECTRIC CO., INC., 118 CHURCH ST., BUFFALO, N. Y.

OFFICES IN ALL PRINCIPAL CITIES

POWER • LIGHTING • LOAD CENTER • OIL-IMMERSED • DISTRIBUTION • UNIT SUBSTATION • DRY-AIR COOLED • NON-INFLAMMABLE

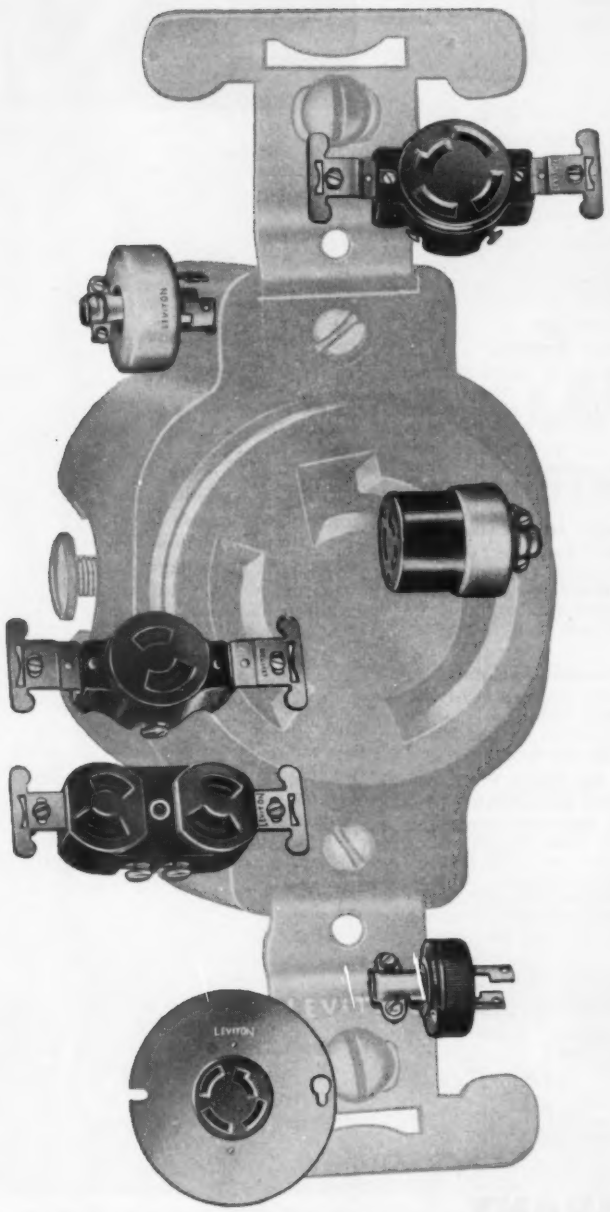
BUSY MAN these days is Walter J. Barnes, whose firm, Walter J. Barnes Electric Co., is playing a significant role in electrical industrial construction in the New Orleans, Louisiana, area.

areas); competition from contractors of lesser experience or operating at a presumed economic advantage; work performed by other than electrical contractors; materials furnished by others; a misconception that some one other than a contractor can do electrical construction more economically.

Progress in the solution of these problems, Cornish said, will be made ". . . in proportion to the extent that contractors more definitely recognize all of their costs and reflect them in their bids and charges, improve the efficiency of their operations, conduct their businesses more in line with generally accepted standards of business practice, develop to the fullest the potential market for electrical construction and heighten their status in the minds of the entire electrical industry."

Certain specific collective activities, Cornish advised, will help overcome these problems. Among them are the development, promotion and use of:

1. Sound estimating procedures, good forms, accurate and comprehensive labor cost data and direct job expense data.
2. Accurate operating cost data including overhead costs, tool and equipment rental costs.
3. Sound management procedures including accounting, shop and job management, sales engineering and business development.
4. Sound administration procedures and policies including intelligent business and financial analyses.
5. Pointing up the unsound economics of "labor only" work.
6. Pointing up the unsound economics of customer doing complete installation with his own forces.
7. Pointing out to manufacturers and distributors that the electrical con-



. . . providing safe dependable connections under severest conditions of vibration, motion or accidental pull-out.

LEV·O·LOCK
DEVICES

These new LEV-O-LOCK devices incorporate every up-to-the-minute advance in design and engineering. Just a turn of the cap provides a secure connection that will not shake loose . . . that assures uninterrupted power flow. LEV-O-LOCK devices are a must for factories, offices, farms, ships; in the operation of portable power tools, machinery and office equipment. New features include *double wiping contacts in all receptacles*, made of heavy gauge phosphor bronze. Extra large terminal screws and ample room make wiring fast and easy. Rigid quality control from raw material to final inspection is your assurance of a superior product. *Send for bulletins LL and NPB 16.*

LEV-O-LOCK devices are available in 2-3-4 wire caps, connectors and receptacles in 10 and 20 Amp ratings. Approved by Underwriters' Laboratories.

LEVITON MANUFACTURING COMPANY

Brooklyn 22, N. Y. • Chicago and Los Angeles
LEVITON (CANADA) LIMITED, MONTREAL

ADV.

NOT ALL

Air-Cooled Dry-Type Transformers are Underwriters' Approved

[Check the "approved" power transformers in the Electrical Equipment List issued by Underwriters' Laboratories]

The few makes which are on the "Underwriters' Laboratories" list, include Sorgel air-cooled transformers, which have been tested and approved under the "Reexamination Service" for more than 25 years.

All Sorgel transformers are constructed according to the latest Underwriters' Laboratories standards. They also meet all the requirements of the A.S.A., A.I.E.E., and N.E.M.A. standards.

Not Just an Ordinary Transformer

In addition to being approved by Underwriters' Laboratories, all Sorgel air-cooled transformers comply with the most rigid specifications of engineers and the electrical industry. That is why they are universally accepted by discriminating engineers and users.

Easy and Low Cost Installation

All self-contained in a single unit. Three-phase transformers are also in a single unit, with simple connections to make. No separate mounting brackets or junction boxes to make or buy. Substantial wall brackets, with slots for bolts or floor mounting base, are an integral part of Sorgel transformers. Roomy connection compartment with wide choice of knock-outs. All transformers are equipped with solderless terminal lugs, and permanent connection diagram.

Sorgel air-cooled dry-type transformers are so quiet in operation that there is no disturbing hum; therefore they can be installed in almost any convenient place inside of buildings, close to the load center. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Liberal Design for Full Rated Load

Sorgel air-cooled dry-type transformers are guaranteed to carry the full rated load continuously, and are so liberally designed that they can safely carry an overload during an emergency.

Rugged Construction

All fabricated steel frames and enclosures. No castings or flimsy enclosures that might be broken or damaged during shipping or handling.

The Price Question

Because these superior features cost more to incorporate in Sorgel air-cooled transformers, our price may not always be the lowest; however, the little additional price you might sometimes pay will be saved several times over in extra service and lower installation costs.

A Perfect Partner for Substations

Sorgel transformers can also be incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.

Unmatched Experience Record

The Sorgel Electric Co. has nearly 40 years of continuous experience in the development, manufacturing, and application of dry-type transformers.

Large Variety for Every Purpose

These transformers are available in a large variety of sizes and types for every purpose. ¼ Kva to 1,000 Kva single phase. 1 kva to 3,000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltages.

Stock carried by jobbers in the following cities:

Chicago, Illinois	Rock Island, Ill.	Davenport, Iowa
Cleveland, Ohio	Rockford, Ill.	Cedar Rapids, Iowa
Los Angeles, Calif.,	Richmond, Ind.	Roxbury, Mass.
Milwaukee, Wis.	Omaha, Neb.	Buffalo, N. Y.
	Beaumont, Tex.	New York, N. Y.

Consult the classified section of your telephone directory or communicate with

SORGEL ELECTRIC COMPANY

836 West National Ave., Milwaukee 4, Wis.

OUTLOOK for electrical construction work in Southern California in 1954 is good, probably equal to 1953's record volume, says A. W. Myers, President of NECA's San Diego Chapter.

tractor is the best channel for final distribution of materials, equipment and fixtures to the customer.

While discussing these points, Mr. Cornish reviewed the expanded NECA research activities and educational courses presented by various chapters covering accounting, estimating, sales engineering, job management and business administration.

An open forum on problems confronting contractors, consulting engineers and architects revealed the following: Consultants are touchy about fixture substitution because of architects choice on an esthetic as well as functional basis; contractors should be given enough time to accurately figure jobs; electrical plans and specifications should be complete; consultants in the Twin-Cities area favor separate bids on mechanical trades. Wholesalers were criticized for holding out until the last minute price quotations (for competitive reasons) to contractors.

Lester E. Barrett, president, Barrett Electrical Supply Co., St. Louis, Mo., and chairman, Plan Committee, National Adequate Wiring Bureau, stressed the need for more adequate wiring activity at a noon luncheon meeting. Speaking on the subject "No Wires—No Business," Barrett traced the 28-year advance of electrical usage in the residence from 13½ million wired homes with an average annual kwhr consumption per customer of 430 in 1925 to over 42 million wired homes in 1953 with an average annual consumption of 2,345 kwhrs per customer. Last year there were over 37 million refrigerators in use (compared to 6 million in 1935); more than 10 million

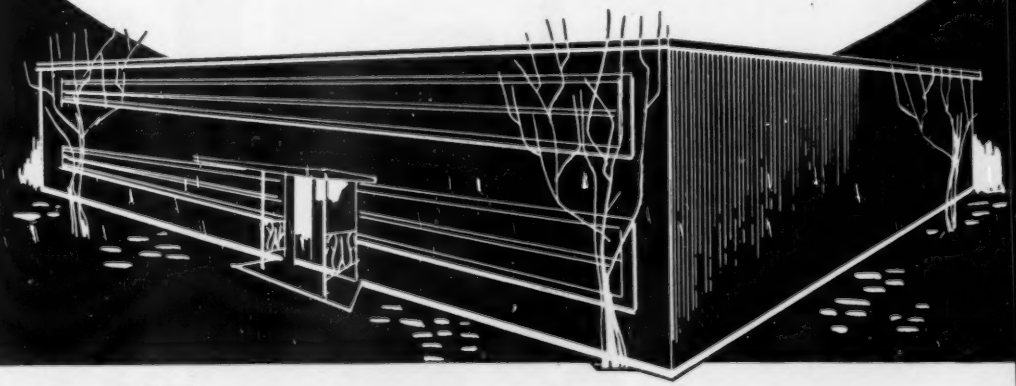
Wheeler Lighting Installation
or Doelcam Corp., Boston, Mass.
ockwood Greene Engineers, Inc.

Wheeler

LIGHTING FIXTURES

A BASIC PRODUCTION TOOL OF AMERICA'S LEADING INDUSTRIES!

Where good lighting is a "must," you'll find Wheeler on the job! In industry after industry . . where modern progressive thinking rules . . Wheeler Lighting Fixtures are the logical choice for maximum lighting efficiency!



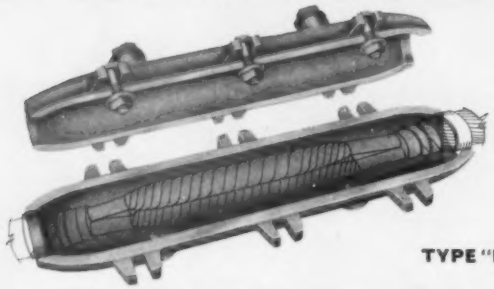
Wheeler WHEELER REFLECTOR COMPANY

275 CONGRESS STREET, BOSTON 10, MASS.

Lighting Equipment Specialists Since 1881

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Protect your CABLE JOINTS with G & W SPLICE BOXES



TYPE "DB"

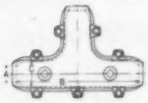
Type "DB" Splice Boxes are split lengthwise in identical halves clamped together with galvanized steel bolts. These cast iron splice boxes are primarily intended for protecting lead sleeve joints on armored cables buried in the ground. They are frequently used for enclosing joints without lead sleeves.

The top half has large filling holes (with gasketed plugs) for compounding. The bottom half has screws on inside of bosses for bonding metallic cable coverings.

Send for your copy of G & W Bulletin BA52 listing CABLE BOXES.

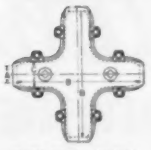
TWO WAY—STRAIGHT

4 Sizes	Dimensions " A	B	C
#DB2102	1¼	10	2
#DB2153	2	15	3
#DB2204	2¾	20	4
#DB2255	3½	25	5



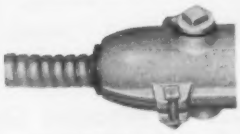
THREE WAY—TEE

3 Sizes	Dimensions " A	B	C
#DB3102	1¼	10	2
#DB3153	2	15	3
#DB3204	2¾	20	4

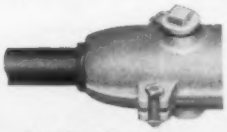


FOUR-WAY—CROSS

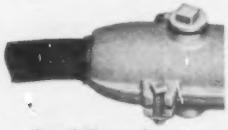
2 Sizes	Dimensions " A	B	C
#DB4102	1¼	10	2
#DB4153	2	15	3



Interlocking Armor



Lead or Neoprene



Steel Tape Armor

G & W ELECTRIC SPECIALTY CO.

7780 Dante Avenue
Chicago 19, Illinois

Representatives in principal cities of U.S.A. In Canada—Powerlite Devices, Ltd.

B531a

CHECKING PLANS of the extensive electric job at the New Orleans Public Grain Elevators is Harry Nienaber, manager of Victory Electric Works, New Orleans, La., co-venture electrical contractors on the job with Fischbach and Moore, Inc.

ranges (compared to 1 million in 1935); more than 5 million water heaters (compared to 1 million in 1946); and over 900,000 room air conditioners.

The room air conditioner is "the little straw that just about broke the camel's back," Barrett noted adding that "the sale of this one appliance drove home to the entire electrical industry in a most dramatic way what inadequacy in an electrical distribution system can mean to the profit structure of a business. Only when about 15 percent of room air conditioners sold during the past two years were returned because customers' wiring couldn't stand the load, did appliance people begin to get the AW picture in focus."

"In 1954, we have a larger number of wholehearted supporters of a do-something AW program than ever before," Barrett revealed. "Only by collective long range planning and action with everyone (management and labor) participating can we hope to solve this problem," he concluded.

With the aid of some 10 crates of equipment, T. C. Sargent, Sylvania Electric Products Inc., Salem, Mass., presented to a packed house a fast-moving demonstration and review of lighting progress during the past year.

Old-Timers Honored At St. Paul Convention

An electrical contractor, inspector and maintenance electrician were among eight electrical industry representatives honored at the 17 Annual Electrical Industry Convention Ban-

ROCKBESTOS
WIRES and CABLES
Stocked from Coast to Coast
For *Fast* Delivery

ROCKBESTOS A.V.C.® — N.E.C. TYPE AVA

No matter where you're located, you can get Rockbestos Wires and Cables in popular sizes of standard Rockbestos A.V.C. Constructions (N.E.C. Types AVA, AVB, etc.) without delay.

Call or write the branch office nearest you — Your orders for standard N.E.C. types in popular sizes will be filled from stock.

MAIN OFFICE AND FACTORY
Nicoll and Canner Sts., New Haven 4, Conn., Tel: State 7-1141

DISTRICT SALES OFFICES

NEW YORK 17, N. Y.
5942 Grand Central Terminal
Tel: Murray Hill 6-7745

DETROIT 21, MICH.
18954 James Couzens Highway
Tel: University 4-7422

ST. LOUIS 1, MO.
2126 Railway Exchange Bldg.
Tel: Chestnut 8641

CLEVELAND 21, OHIO
2000 Warrensville Center Rd.
Tel: Evergreen 2-3344

NEW ORLEANS 12, LA.
International Trade Mart, Rm. 234
124 Camp St.
Tel: Tulane 6551

SEATTLE 1, WASHINGTON
314 Lloyd Bldg.
Tel: Seneca 1553

CHICAGO 24, ILL.
4534 West Madison St.
Tel: Esterbrook 9-2265
Warehouse

PITTSBURGH 19, PA.
2637 Koppers Bldg.
Tel: Atlantic 1-4486

OAKLAND 14, CAL.
Oakland Municipal Airport
Tel. Sweetwood 8-2955
Warehouse

LOS ANGELES 5, CAL.
4020 W. Third St.
Tel: Dunkirk 8-8879

ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT

Monarch

"FLOWS" BRASS to FIBRE *to give you a* QUALITY FUSE with LONGER LIFE!

Threaded Brass Ferrule Fitting "Flows" to Fibre Tube under great pressure for perfect junction. No rivets to weaken tube as in other fuses. No exposed brass inside barrel.
Monarch
60
UNDR. LAB., INC. INSPECTED FUSE

Monarch is the only fuse with this new construction feature. Fibre barrels cannot loosen from brass fittings. There are no rivets or pins to cause hot spots and char the fibre barrel. It means you get a quality fuse with better protection . . . over a longer operating period . . . and at the regular fuse price.

Ask your wholesaler now or write for further information.

Monarch Fuse Co., LTD.

Jamestown, New York

RESPONSIBILITY FOR the successful operation of the electric motor repair department of Clement Electric Company, Grand Rapids, Michigan, rests on the broad shoulders of Paul D. Bogdan. During his seventeen years as shop superintendent he has initiated many time-saving and efficiency-boosting shop programs, contributing numerous shop "kinks" and equipment gadgets.

quet held at the St. Paul Hotel, St. Paul, Minnesota, March 24th. Each of these men has spent 50 years or more in the electrical industry. Each received a Golden Jubilee Pioneer Award Certificate commemorating this milestone.

Recipients of the 1954 certificates were the following:

R. E. Stover, electrical contractor, St. Paul, Minn.—Mr. Stover started in the electrical trade in 1901, worked as an electrician for the M. J. O'Neil Co., the Fred Robertson Electric Company and the St. Paul Utility Company. After 20 years, he decided to go into business for himself as an electrical contractor in St. Paul. He is still active in management of his firm.

Paul H. Shillock, electrical inspector, St. Paul, Minn.—Mr. Shillock started in 1902 as an employee of the Chaska Light and Power Company. Then he worked for the Electric Machinery Manufacturing Co., Pioneer Electric Company (contractor), Great Northern Railroad, and the Hanley Casey Company. In 1915 he was appointed an electrical inspector for the city of St. Paul and has continued in that post since.

C. Harris Judd, chief electrician, Osman Temple of the Shrine of St. Paul.—Mr. Judd, still active at the age of 71, started in the electrical industry with the Brush Electric Light Company of Philadelphia in 1899. Before attaining his present position, he worked in St. Paul for Nimis & Nimis, Pioneer Electric Co., Northern Pacific Railroad and Northern States Power Company.

John W. Brooks, vice president, Pass & Seymour, Inc., of Syracuse,

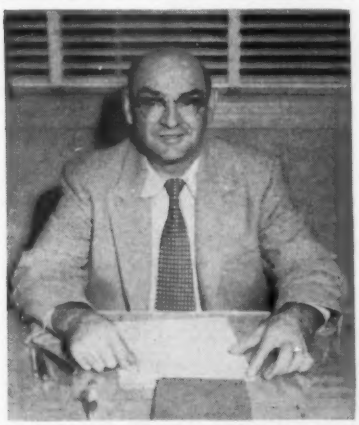
N. Y.—Mr. Brooks was manufacturer's representative in Chicago for Pass & Seymour, Inc., and Crouse-Hinds Company in 1898. In 1903 he was appointed general sales manager of Pass & Seymour and is still active as vice president and member of the Board of Directors of that firm.

Sigurd Larson, Dakota Electric Supply Co., Fargo, N. D.—Mr. Larson began his electrical industry career with the Dakota Electric Supply Co. in Fargo in 1903 and advanced to the position of purchasing agent with the firm.

Frank G. Klein, St. Paul, Minn.—Mr. Klein started in the electrical industry in 1904 with a city desk job at the Northwest Electric Supply Corporation and continued as a salesman for that company until his retirement in 1952. He is now a manufacturers' representative of electrical equipment.

Ernest P. Bartlett, Chicago, Illinois.—Mr. Bartlett started his electrical career as the Chicago representative of the Narragansett Wire Company. In 1898 he joined the staff of John A. Roebling's Sons Corporation. Shortly before World War I, he went in business for himself as a manufacturer's representative. Having rounded out 60 years of service in the electrical industry, he still carries on at the age of 80.

Charles Foster, Duluth, Minn.—Since his graduation from college in 1897, Mr. Foster has been active in the electrical engineering field. Since 1922 he has been engaged as a general consulting engineer in Duluth and was recently appointed to the Minnesota State Board of Electricity. At 80 years of age, he still is active in his chosen field.



W. E. BUTCHER has built Butcher Electrical Service, Dallas, Texas, to the point where this firm now has separate operating departments for Residential Wiring, Commercial and Industrial Wiring, Electrical Maintenance and Lighting Maintenance.

THE NEW MODEL 640

INDUSTRIAL ANALYZER

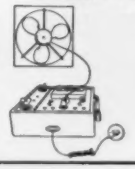
Provides all the measuring services required for maintenance, development, testing and repair work. Accurately makes the three basic electric measurements —VOLTS, OHMS and AMPERES. The Model 640 includes many technical advances and improvements. Operates on a self-contained standard battery and is therefore always ready for use. *No external source of current is required!*

A single scale is used for making all voltage measurements—both A.C. and D.C. Unique circuit design results in close-to-perfect linear scale with no variation between A.C. and D.C. measurements. Thus, one scale is used for all voltage ranges!

FEATURES

Precision Calibrated External Shunt for High Currents

An accurately calibrated external shunt enables exact HIGH CURRENT measurements up to 75 amperes.



Automatic Current Measurements

The Model 640 will measure the actual current consumption of any electrical device while the unit is in operation and without breaking any connections. To accomplish this, it is necessary only to plug the unit directly into the front panel receptacle of the Model 640. An accessory line cord included with the Model 640 is then plugged directly into the line.

Specifications:

A.C. Voltages:	**0-15 volts**	**0-150 volts**	**0-750 volts**
D.C. Voltages:	**0-15 volts**	**0-150 volts**	**0-750 volts**
Resistance:	**0-1,000 ohms**	**0-10,000 ohms**	
Current:	**0-7.5 amperes**	**0-15 amperes**	**0-75 amperes**

Model 640 comes housed in hand-rubbed oak cabinet. Absolutely complete including external shunt, one pair prod leads, one pair clip leads and detailed operating instructions. Size is 5" x 9" x 9". Only **48.75**

Shipped to you for 30 days

ON APPROVAL

We invite you to try this unit for 30 days. If after testing it you decide it meets with your requirements, we will then (30 days after shipment) issue our formal invoice in the amount of $48.75. If not completely satisfied with the instrument, simply return it to us, cancelling any further obligation.

Superior Instruments Co., Dept. EC-5
2435 White Plains Road, New York 67, N. Y.

Please ship 1 model 640 Industrial Analyzer on 30 day memo. If we decide to keep it after the 30 day trial you will issue your formal invoice. If it does not meet our requirements, we will return it cancelling any further obligation.

Name_____

Address_____

City_____ **Zone**____ **State**_____

READ BOTH CURRENT AND VOLTAGE *At a FAST CLIP!*

with the

COLUMBIA

$57.50
With Voltage Leads and Carrying Case

TYPE AC-1 VOLT-AMMETER

Ampere readings are taken in a few seconds with the Columbia Clamp-Type Volt-Ammeter. With one hand you can open jaws, set range switch and encircle conductor. No breaking of circuit or insulation required. Safety plug-in leads are provided for quick voltage readings. Measures up to 600 amperes and 600 volts alternating current.

Handiest precision instrument of its type. Light weight—fits easily into pocket. Insulated jaws accommodate bare conductors or insulated cables up to 1¼" diameter or bus bars up to 2" x ½". Convenient switch enables operator to select the following A.C. ranges: 0/12/60/120/600 amperes; 0/150/600 volts. The Type AC-1 is the latest addition to the line of Columbia instruments having an established reputation of highest quality and dependability.

Write for descriptive Bulletin AC-41

COLUMBIA ELECTRIC MFG. CO. 4541 Hamilton Ave. Cleveland 14, Ohio

WHEELOCK CODE CALL

for immediate communication

Descriptive Bulletin 4B-3 available on request. Write for your copy now to Signal Engineering & Mfg. Co., Long Branch, New Jersey.

The busy switchboard operator just presses the button; a numerical code call sounds off throughout the building and the person being paged responds via the nearest telephone. The cycle is as simple as that. Also learn how easy it is to install a Wheelock Code Call System with any desired combination of chimes, bells, horns and other signalling devices.

New CODE CALL SYSTEMS

Wheelock CODE CALL SIGNAL

Engineering Representatives in Principal Cities

CHECKING electric space heating loads against circuit capacity are (L to R) Edward Breliant, vice president, and E. C. Anthony, estimator and superintendent of Allied Electric Co., Maywood, Illinois. Project is the complete glass panel electric radiant heating system installed by Allied at St. Simeons Rectory in Bellwood, Illinois.

Dallas Electric Club Hears D. B. Clayton

Don Clayton, president of NECA, was the principal speaker at a luncheon meeting of the Dallas Electric Club at the Baker Hotel, Dallas, Texas, on April 19. Speaking to a large assembly of consulting engineers, electrical contractors, wholesalers and manufacturers' representatives, Mr. Clayton talked on the future of the electrical industry and the part electrical contractors will play in it.

About the future, Mr. Clayton stated flatly that "No member of the electrical industry can be pessimistic, if he is the least bit realistic". Although there has been some tapering off of activity, he feels that new construction and modernization markets are still expanding. To help electrical contractors take full advantage of the market potential, he said NECA has developed its program "to have electrical contractors known favorably" and to "help qualify contractors, be they members of NECA or not".

Mr. Clayton described at length the characteristics of a well-qualified electrical contracting firm. He stated "there are many contractors who, according to the above description, fail to qualify. We have them in and out of the Association, and . . . we have put into execution programs to help . . . correct this condition."

At the meeting, Lawrence Martin, NECA Chapter Manager in Dallas, introduced Ft. Worth and Dallas electrical contractors who were present as his guests.

september
15
DETAILS INSIDE

In a scant 4 months all over the

maintenance men as a regular part of their PAID subs
exclusively to their job interests). As an annual supplement
their year 'round needs for technical data and product sele

The will have 3 editorial se
one book, a of useful information. Let's examine

The TECHNICAL DATA REFERENCE ... a compilation of data, useful every d
of the year. Symbols, diagrams, definitions, tables, formulae, practical c
culations. Data on lighting, basic circuitry, industrial electronics, moto
and motor controls.

Size AWG MCM	Rubber Type R, Type RW, Type RU, Type RUW (14-2) / Thermoplastic Type T, Type TW	Rubber Type RH	Paper / Thermoplastic Asbestos Type TA / Var-Cam Type V / Asbestos Var-Cam Type AVB	Asbestos Var-Cam Type AVA, Type AVL
14	15	15	25	30
12	20	20		
10	30			

POWER LOSS: ANY AC OR D

$P = I^2R$ $I = \sqrt{\frac{P}{R}}$ $R = \frac{P}{I^2}$

P = power heat loss in circuit (watts)
I = effective current in conductor (amp
R = conductor resistance (ohms)

The PRODUCT DIRECTORY . . . *1,600* specific products, listed alphabetical
with cross-references. Under each product heading manufacturers will
listed alphabetically with names and *complete addresses*.

BASES, ADJUSTABLE MOTOR
Acme Battery Corp.
Allis Co., Louis
Allis-Chalmers Manufacturing Co.
American Pulley Co.
General Electric Co., Apparatus Sales Div.

BASES, CUTOUT
see ***HOLDERS, Low Voltage Cartridge Fuse; CUTOUTS, Plug Fuse***

BASES, MOTOR
see ***BASES, Adjustable Motor; BASES, Vibration Insulating***

BASES, VIBRATION INSULATING
Core.

Electric Storage Battery Co.
Excello Battery Co.
General Lead Batteries Co.
Gould-National Batteries, Inc.
Hobbs Battery Co.
K. W. Battery Co.
Koehler Manufacturing Co.
Lord-Taber Co., Inc.
Marlatt Battery Div.
Perrine Battery Corp.
Price Battery Corp.
Pure Oil Co.
Scranton Battery
Staab Battery M
Standard El
Surrette
Vitalic
Willia

The COMPANY AND TRADE NAME DIRECTORY . . . a complete alphabetic
roster of names and addresses of all *verified* manufacturers represented
the PRODUCT DIRECTORY. Trade and brand names of these manufacture
also will be listed, in capital letters, and identified with the companies clai
ing them.

A

A-A Electric Mfg. Co., Inc., 131 Chestnut St., New Haven, Connecticut
AB—Anaconda Wire & Cable Co.
A-B Stoves Div.—see Detroit-Michigan Stove Co.
ADT Protection Services—see American District Telegraph Co.
AECO—American Electric Cable Co.
AG—Farrelloy Company
A. G. E. Inc., Bryant Heater Div., 17825 St. Clair Ave., Cleveland 10, Ohio
AHT—Anaconda Wire & Cable Co.
A. J. F. Industries, Inc., 852 Monroe St., Brooklyn
Co.

Adams Company, 100 East Fourth
ADAPTABEL—Edwards Company,
ADAPTAHORN—Edwards Compan
ADD-A-BREAKER—Westinghous
ADDA-STRIP—Garden City Pl
ADJUST-O-LITES—Litecraft
ADJUST-O-MATIC—Westin
ADJUST-O-SPOTS—Litecr
Adjustable Fixture Co., 2, Wisconsin
ADJUSTO-CORD—Dorn
Admiral Corporation, Illinois
ADVANCE—Acme
ADVANCE—Driv
Advance Electr Burbank
Advanc

will deliver the EPG to 30,000 eager electrical construction and

subscriptions to E. C. & M. (the only magazine edited

ement, the EPG will be especially edited to satisfy

t selection information.

ial sections which will bring together, between the covers of

mine these sections.

Of course, when any one of our 30,000 (PAID) subscribers turns to the EPG, he'll want all necessary information on which to base a specification or purchase. He'll find it too. From the COMPANY AND TRADE NAME and PRODUCT DIRECTORIES he'll get the names and addresses of VERIFIED MANUFACTURERS. Important product details for product selection will be there too . . . convenient, specific . . . in the **advertising pages.**

For example:

1. Companies with a range of products, using one or more pages of advertising or briefed catalogs, will be positioned in the special MANUFACTURERS' PRODUCT DATA SECTION. Companies with advertising in this section will be prominently identified in the PRODUCT DIRECTORY with marginal symbols (•), bold-face listings and advertising page references for each product described in advertising. This procedure will give subscribers the two essentials for buying or specifying: (1) information on who makes it, and (2) product data for selection purposes when they turn to the advertising pages to which they are referred. This is all the information needed to specify or buy.

2. Companies with limited lines, using one page or less to describe individual products, will be positioned in the PRODUCT DIRECTORY adjacent to the product their advertising describes. Through this special make-up in the PRODUCT DIRECTORY, subscribers will also be able to study product details while checking sources of supply.

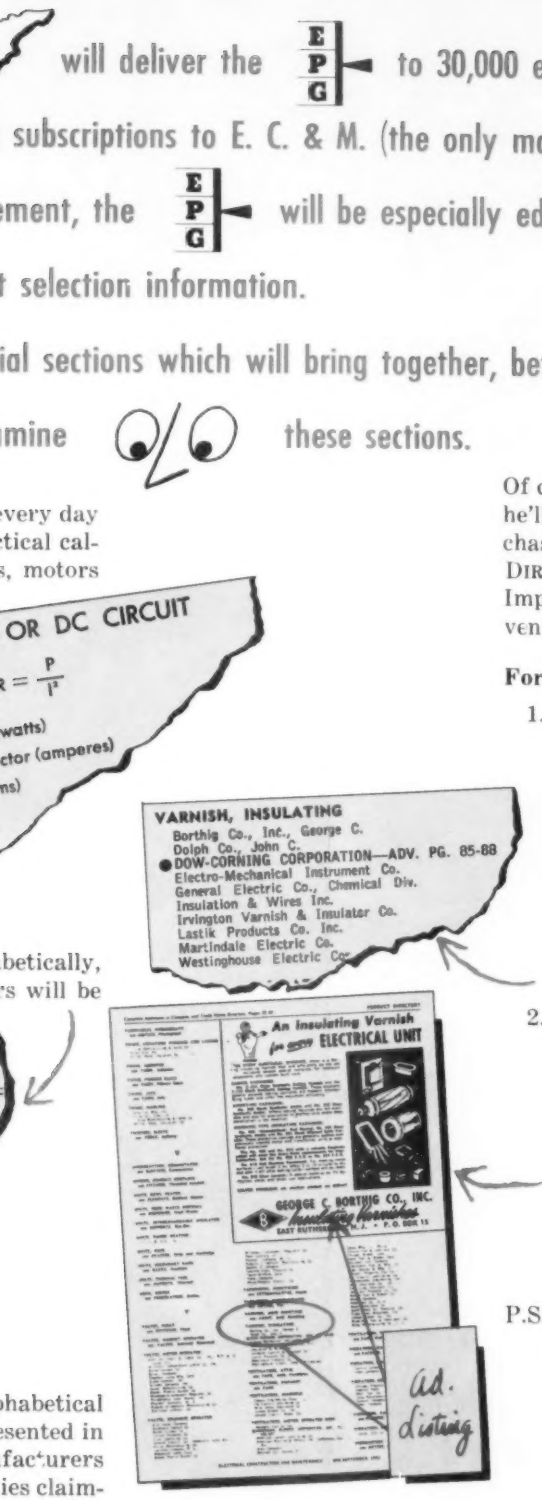
Note: Only companies with advertising in the MANUFACTURERS' PRODUCT DATA SECTION will be identified in the PRODUCT DIRECTORY with marginal symbols (•), bold-face listings, and advertising page references.

P.S. If you're one of our 27,500 subscribers who received the 1st annual EPG last September, the forthcoming EPG will contain all of the technical data and verified product information you're finding so convenient and useful. However, it will be BIGGER, and more COMPLETE. If you're one of our recent, or future, subscribers . . . here's a friendly tip: take good care of your EPG. High production costs will make it almost impossible to obtain a replacement copy. Don't find yourself in the same boat with one subscriber who wrote: *"Please send me another copy. Someone borrowed mine, and I haven't seen it since. It must be good; they keep delaying to return it."*

Publication date: Mid-September

CLOSING DATES for advertisers:

JUNE 18TH FOR RESERVATIONS
JUNE 25TH FOR COPY TO BE SET
JULY 2ND FOR COMPLETE PLATES



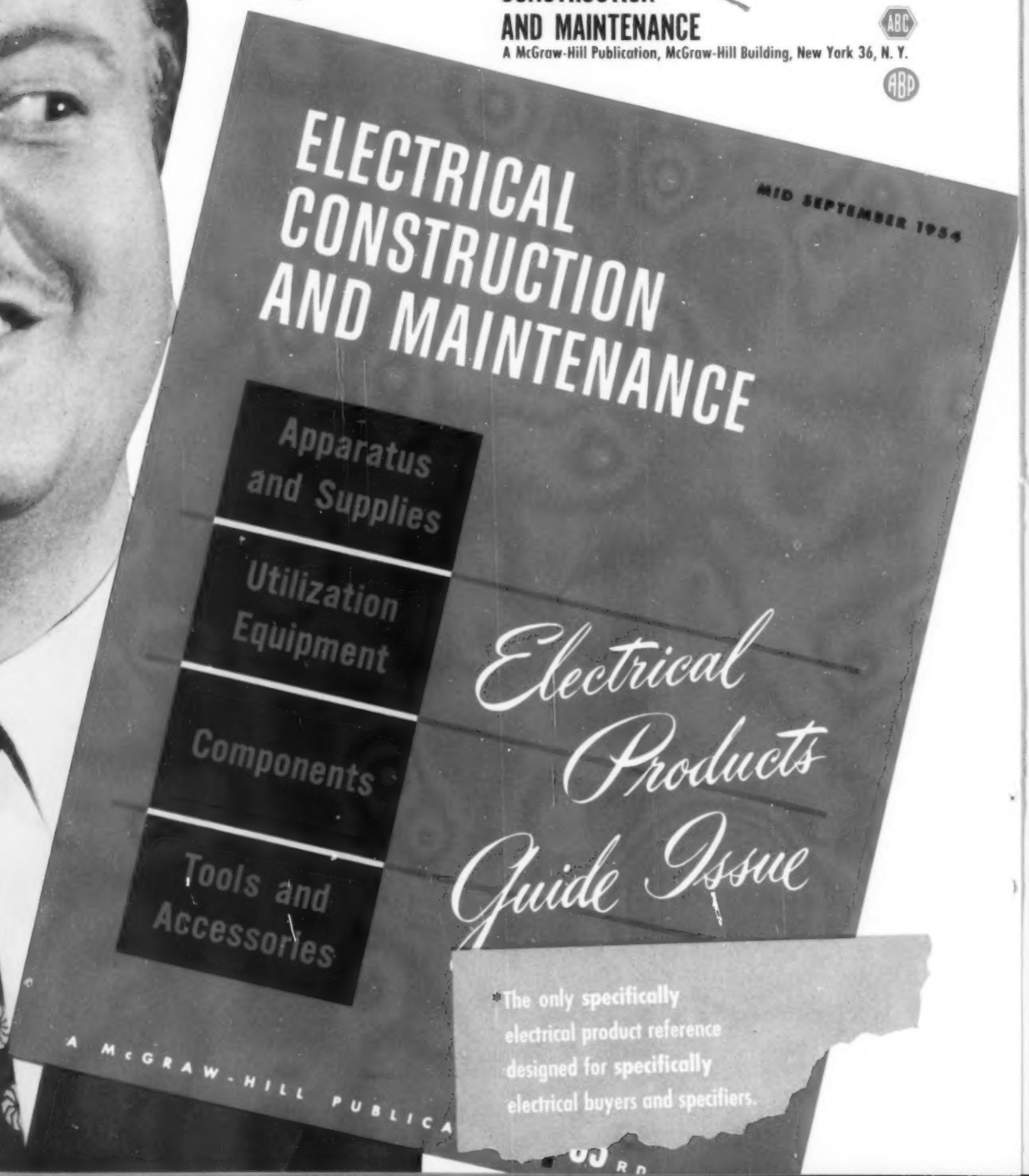
THE 1954-55

If you're one of the 30,000 electrical construction and maintenance men who subscribe to E. C. & M., you'll receive the 2nd annual EPG* on September 15th as a regular part of your subscription to . . .

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGraw-Hill Publication, McGraw-Hill Building, New York 36, N. Y.

ABC ABP



*The only specifically electrical product reference designed for specifically electrical buyers and specifiers.

Rochester Honors B. A. McDonald

Rochester, N. Y. area electrical industry leaders eulogized former Chief Electrical Inspector B. A. McDonald at a testimonial dinner on April 22 in recognition of his election to the presidency of the International Association of Electrical Inspectors. More than 300 electrical contractors, wholesalers, inspectors and utility men attended to honor the nationally famous authority on the Code.

Jack O'Connell, O'Connell Electric Co., for the contractors, Homer Locke, Kovelsky-Carr, for the wholesalers, and Howard Brown for the utilities reviewed McDonald's constructive encouragement of modern, safe electrical practices. James Lynett, New York Board of Fire Underwriters, and William Clark, Chief Inspector, Rochester reviewed McDonald's activities within the inspectors' association, W. T. Stuart, editor of *Electrical Construction and Maintenance*, outlined the scope and constructive force of McDonald's nationwide counsel on Code problems and interpretation.

(B. A. McDonald is a consulting editor of *Electrical Construction and Maintenance* and a member of the panel of experts who conduct the "Questions on the Code" department.)

Scott Milne Named President of IBEW

A new team has taken over the leadership of the International Brotherhood of Electrical Workers (AFL).

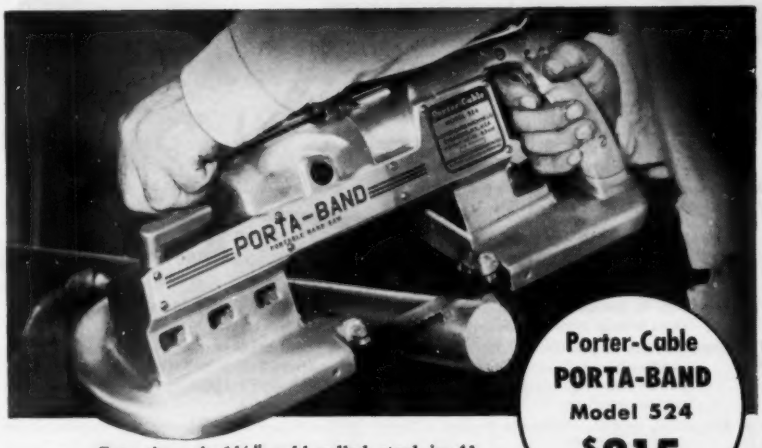
Moving into the top posts of the 600,000-member union are J. Scott Milne, who becomes International president, and Joseph D. Keenan, who succeeds Milne as secretary-treasurer of the organization. Both were only 18 years old when they joined the IBEW.

Their selection to head the big electrical union came about as the result of the resignation of long-time president Dan W. Tracy, who decided to step down at this time because his union was in the "best condition" since it was founded in 1891. Tracy has been an IBEW officer for the past 40 years, serving the last 14 years as president. During his career, Tracy took a leave of absence as executive vice-president to serve as Assistant Secretary of Labor in 1940 on appointment by President Roosevelt.

In accepting Tracy's resignation, the IBEW Executive Board acted to make him president emeritus of the union. He will continue to serve on the policy-

new Portable BAND SAW!

Cuts metal 15 times faster than a hack saw!



Porter-Cable PORTA-BAND Model 524 $215

Cuts through 1½" cold rolled steel in 41 secs.! That's 15 times faster than a hand hack saw . . . 2½ times faster than larger power hack saws!

• Cuts all types of cable up to 3¼" dia. Saws ferrous and non-ferrous metals, "problem" materials, in bar, tube, angle or strip form.

• Take Porta-Band anywhere in the plant or out in the field. Portable, compact, light—perfect for new construction, general maintenance or teardowns.

• In tight, awkward spots like this, Porta-Band delivers smooth, controlled sawing on any position—eliminates fatigue—cuts costs.

- Weighs only 16 lbs. Band speed: 240 f.p.m.
- Precision ball and needle bearings throughout.
- Universal AC-DC, 25-60 cycle motor (230V available at extra cost).

Porter-Cable *Quality Electric Tools*

PORTER-CABLE Machine Co.
2085 N. Salina St., Syracuse 8, N. Y.
(In Canada, send to Strongridge, Ltd., London, Ont.)

MAIL COUPON FOR COMPLETE INFORMATION

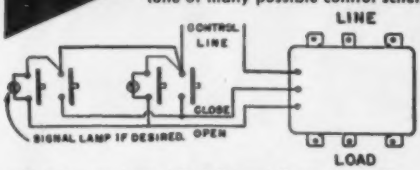
Send full information on PORTA-BAND and name of nearest dealer.

Name.....
Company.....
Type of Business.....
Street.....
City..... County..... State.....

Manufacturers of Speedmatic and Guild Electric Tools

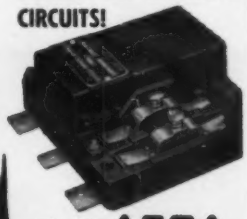
Suggestions from ASCO®
Remote Control of Lighting and Power

This Typical Circuit
(one of many possible control schemes)



ASCO Remote Control Switch (push button control)
Any Number of Stations Permissible

SAVE ON MODERNIZATION OF POWER and LIGHTING CIRCUITS!



with this ASCO Mechanically Held Remote Control Switch

Gives You These 4 Proved Remote Control Switch Advantages

1 **Economy in Installation** — Distribution panels can be located to provide straight feeders and short branch circuits, resulting in minimum line drop and losses.

2 **Convenience in Control** — Control Stations may be located at convenient points and connections made with small wires. For example with a 60 Ampere Switch at 110 volts, #12 wire may be run 750 Feet! Instant disconnect of lighting and power feeders may be made from convenient locations.

3 **Simplicity and Flexibility in Design** — Design can be determined by logical distribution rather than accessibility of control. This makes wiring layout simple, and flexible for future expansion.

4 **Safety in Emergencies** — Vital circuits may be controlled instantaneously from one or more readily accessible locations.

ASCO Remote Control Switches are unaffected by line voltage conditions. No A-C hum — the solenoid coil is energized only during the instant of operation.

Write us about your requirements. ASCO Remote Control Switches range from 30 to 1000 amperes, 2 to 24 poles, 110 to 750 volts. A-C and D-C; may be double throw; open or enclosed.

ASCO Electro-Magnetic CONTROLS

Automatic Switch Co.
385 Q LAKESIDE AVENUE · ORANGE, NEW JERSEY

Carry WATER, GAS AIR LINES, CABLE *at any angle to beams*

with "EFFICIENCY" CONDUIT HANGER "TYPE F"

On open steel construction. Efficiency "Type F" conduit Hangers are your best choice for carrying ½" to 2½" pipe and armored cable. Patented radiating ridges and 5-point gripping surface keep pipe and cables suspended dead center, permitting it to be carried securely at any angle to the beam. Write today for Catalog 38-A.

Efficiency ELECTRIC AND MANUFACTURING CO.
MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION
EAST PALESTINE, OHIO
"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

J. SCOTT MILNE, president of IBEW.

JOSEPH D. KEENAN, secretary-treasurer of IBEW.

making executive council of the parent American Federation of Labor.

Milne becomes president at the age of 54. While holding down the post of secretary-treasurer during the past seven years, he served in the dual capacity as editor of the *Electrical Workers Journal*. Outside his IBEW positions, he has been holding down assignments as secretary-treasurer of the Eastern Labor Craft Association and president of the International Labor Press of America.

The new IBEW chieftain first joined the electrical workers in 1918 in Portland, Ore., after serving for a brief period in the Canadian Army during World War I. He moved up the ranks of IBEW hierarchy as business manager, International representative and then to vice president of the West Coast Ninth District.

Keenan is returning to the IBEW as number two officer from two high posts in the AFL. Since 1951, he has been a vital cog in the powerful AFL Building Trades Department as its International secretary-treasurer. He took over that job after running the

AFL's political arm—Labor's League for Political Education—for two years.

A union leader with long experience in the nation's capital, Keenan has served the government in a number of important posts. These included advisory positions in the office of production management and later the defense mobilization office. In 1945, he went to Germany with Gen. Lucius Clay as labor adviser.

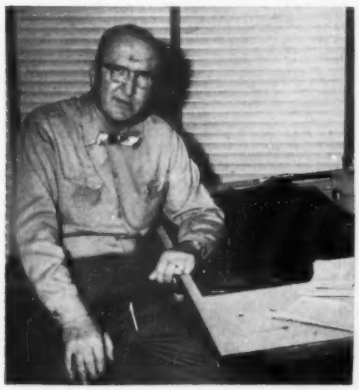
While working outside the IBEW, Keenan has held membership in the Electrical Union—the organization he joined in 1914 as an apprentice. His first official post was recording secretary for an IBEW local in Chicago. From that, he moved up to secretary of the Chicago Federation of Labor.

Milne and Keenan will be formally voted into office at the IBEW Convention in August.

EMEA Holds Annual Show

The Electrical Maintenance Engineers Association of Southern Calfornia held its seventh Electrical Industry Show on April 1-3 at the Shrine Exposition Hall in Los Angeles. Over 9,000 persons attended this three-day show sponsored by EMEA "for the man who writes the specs".

Outstanding features of this annual Spring affair were the 87 exhibits of commercial and industrial electrical equipment displayed by local and national manufacturers, and 17 exhibits which featured educational and technical demonstrations by major universities, arede schools, junior colleges and governmental agencies. A series of 14 films relating to electrical and maintenance subjects was shown daily.



KEEPING PACE with details of electrical installation at Cal. Tech's huge new wind tunnel keeps Archie Morton, superintendent for Hill Electric Co., Inc., Los Angeles, plenty busy while this job is in progress.

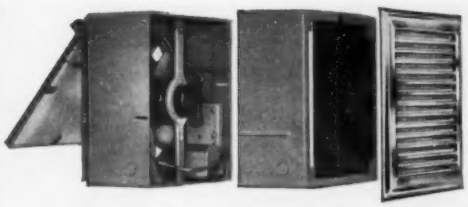
Better quality, Bigger profits —a better buy

Broan

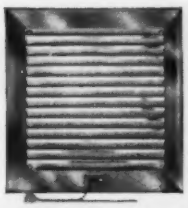
MOTORDOR KITCHEN FANS AND ELECTRIC FAN-TYPE HEATERS

• Today, more and more of the nation's leading Electrical Contractors are standardizing on Broan Kitchen Fans and Bathroom Heaters. The Broan line is your assurance of not only *better quality* and *bigger profits*, but also *greater* ease of installation, *unrivaled* performance, PLUS tested merchandising support and local co-operative promotion.

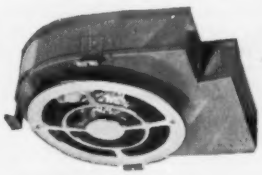
It will pay you to mail the coupon today.



No. 11 MOTORDOR 10" Wall Fan, with *Insulated* and Motor Operated Outer Door, Telescoping Sleeve, and "Fantom-Gril".

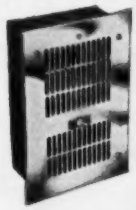


Interior view of No. 6 Chain Control 10" Wall Fan, with "Fantom-Gril".



No. 400 Ceiling Fan (10") with stainless steel grill and back draft damper in housing.

No. 451 Ceiling or Wall Fan (10") with back draft damper and stainless steel grill.



No. S-12 Electric Fan-type Bathroom Heater • • 1200 watts.

No. U-15 Electric Fan-Type Bathroom Heater • • 1500 watts.

BROAN MFG. CO. INC.

1677 N. Water St. Milwaukee 2, Wisconsin

BROAN Mfg., Co., Inc.
1677 N. Water St., Milwaukee 2, Wis.
Please send me a FREE copy of "Extra Profits on Every Job."

Name .....

Address .....

City .....Zone .....State .....

Clean!

NO SMUDGE

NO CLEANUP

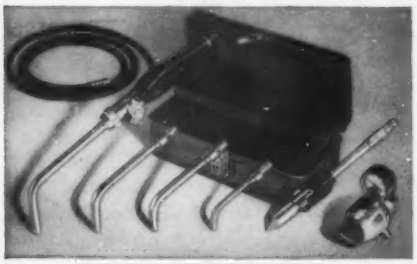
A SAFE SOLDERED JOINT

Prest-O-Lite Trade-Mark

5-in-1 OUTFIT

SOLDER-BRAZE

Eliminate time-wasting and costly cleanup with this air-acetylene outfit. Its flame is clean, hot, easy to handle. One flick of the thumb gives instant working heat. No smoke, fumes, soot, or stain. One handy kit takes care of all of your soldering, heating, and light brazing requirements. See your LINDE Jobber today. Or write LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York 17, N. Y. In Canada: Dominion Oxygen Company, Toronto.



Get it from your LINDE jobber.

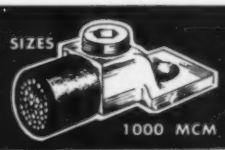
Four stems and a soldering iron handle every type of work. Fully adjustable pressure regulator permits exact flame adjustment for each soldering job.

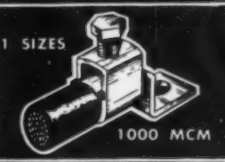
The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.

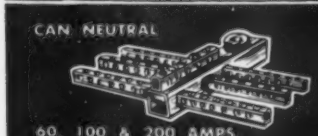
ILSCO

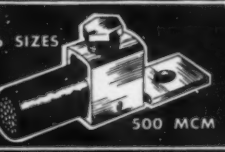
UL QUALITY CSA

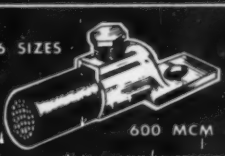
CONNECTORS

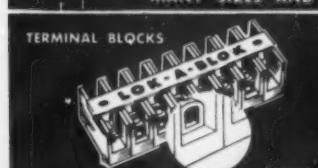


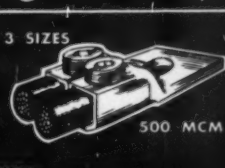












WRITE FOR 80-PAGE CATALOG

ILSCO 5741 MARIEMONT AVE., CINCINNATI 27, OHIO

Philadelphia Contractors Win Lighting Prizes

Fourteen electrical contractors won 16 cash prize awards totaling $700.00 for their winning entries in the Philadelphia Electrical Association's 1953 Lighting Campaign, a promotional lighting activity which has been held annually for several years. In addition to the cash prizes, there were silver plaques and Reddy Kilowatt trophies.

The prize money for this contest was from a special Prize Award Fund created by five local electrical contractor groups which participated in the record-breaking campaign. These groups, all members of the Association, were: Independent Electrical Contractors Association; Pen-Del-Jersey Chapter of NECA; Delaware County Electrical Contractors Association; Bucks-Montgomery Section of the Electrical Association; and the Contractors Division of the Association. Prizes and awards were presented by John A. Morrison, managing director of the Association.

More than 2900 lighting jobs with fixtures totaling nearly a quarter-million dollars in value were sold in the Lighting Campaign, which was sponsored and promoted jointly by the Electrical Association's lighting equipment manufacturers group and the Philadelphia Electric Company, local electric utility. The campaign started September 21, 1953, and ran until January 30, 1954. Prize Awards were announced and presented to winning contestants at the March meeting of the Philadelphia Section of the Illuminating Engineering Society.

For the purposes of the contest, lighting installations were divided into five classifications: commercial (up to 1000 sq ft); commercial (over 1000 sq ft); industrial (up to 2000 sq ft); industrial (over 2000 sq ft); and exterior. Four prizes were awarded in each of the two commercial classifications, three prizes in each of the two industrial classifications, and two prizes in the exterior classification.

Prize winners were as follows: commercial (small)—1st prize, $75.00—Andy Camp, Philadelphia; 2nd prize, $50.00—Edward Barber, Independent Wiring Co., Inc., Philadelphia; 3rd prize, $25.00—Hugh J. McCabe, Norristown; and 4th prize, $12.50—Anthony Zangrilli, Pottstown.

Commercial (large): 1st prize, $75.00—Victor Meierdierck, Victor Electric Co., Ottsville; 2nd prize, $50.00—John E. Cook, Independent Wiring Co., Inc., Philadelphia; 3rd prize, $25.00—Andy Camp, Philadelphia; and 4th prize, $12.50—Robert Keough, Robert Keough & Co., Philadelphia.

Industrial (small): 1st prize, $75.00—Benjamin Busler, Busler Electric Service Co., Philadelphia; 2nd prize, $50.00—Jack Greenberg, Philadelphia; and 3rd prize, $25.00—Harry G. Hey, H. G. Hey Electric Construction Co., Hatboro.

Industrial (large): 1st prize, $75.00—Charles A. Holm, Prospect Park; 2nd prize, $50.00—William A. Gillespie, A. W. Walker Co., Norristown; and 3rd prize, $25.00—David Reed, Philadelphia.

Exterior: 1st prize, $50.00—Robert A. Watterson, C & W Electric Contracting Co., Coatesville; and 2nd prize, $25.00—Harry G. Hey, H. G. Hey Electric Construction Co., Hatboro.

Planning for the new campaign to be conducted in 1954 is already under way, and chairmen of the individual electrical contractor groups will announce complete details before the campaign opens in September.

NECA District 5 Convenes In Tulsa

A joint convention of District 5 of the National Electrical Contractors Association and the International Brotherhood of Electrical Workers was held at the Mayo Hotel, Tulsa, Thursday through Saturday, April 22-24. Representing a fine spirit of understanding and cooperation between labor and management, the convention was attended by over 300 representatives of IBEW locals and electrical contracting firms throughout Oklahoma, Kansas, Arizona, New Mexico, Texas, Arkansas and La.

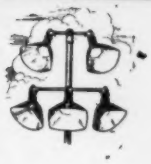
The convention unofficially started

GOING OVER PLANS for a final look after job has been estimated is Rex M. Grissom, estimator and assistant superintendent and Harry J. Becker, chief estimator and general superintendent for Gilbert and Stearns, Santa Ana (Calif.) electrical contractors.

QUAD FLOODLIGHTS

COMPRISE A TOTAL OF 130 UNITS

Each DIFFERENT AS TO SIZE OR SHAPE OF REFLECTOR CHARACTER OF LIGHT DISTRIBUTION OR MOUNTING METHOD



. . . when you sell

QUAD FLOODLIGHTING

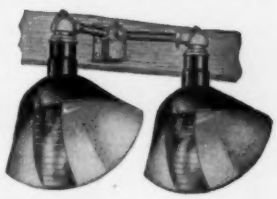
you sell customer satisfaction

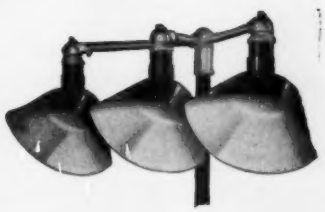
The exclusive QUAD Multiple Mounting saves time and labor. Units of one, two, or three reflectors can be mounted on a wood pole, iron pipe, or any vertical surface.

Each reflector unit can be turned or tilted in any direction—giving the user individual light control. A single head bolt permits adjustment of 180 degrees horizontally and 40 degrees vertically.

Units of various sizes and types can be removed or interchanged without disturbing the wiring.

These are features that help you increase floodlighting sales.





QUADRANGLE MFG. CO.

325. PEORIA ST. CHICAGO 7, ILL.

two engineers can be better than one

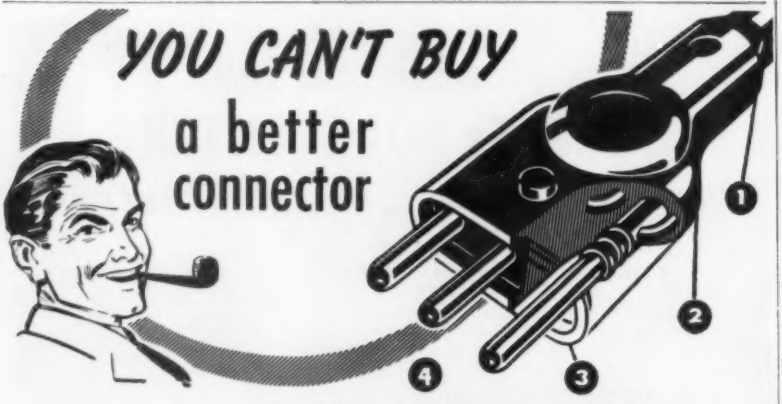
Working together, your plant engineer and STANDARD'S engineer-representative in your area can properly evaluate your transformer requirements. There's no need to adjust your plans to stock models when you buy STANDARD. You get the exact transformer, designed for your particular job.

Standard

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES



. . . AND HERE'S WHY

- Sturdy one-piece cable connector assemblies
- Safe, long-lasting resilient Neoprene jacket
- Water-seal prevents moisture infiltration
- Contacts firmly embedded in connector body

Falls, blows, oil, acids, sunlight and moisture little affect the life or performance of JOY electric plugs or receptacles. Molded as one-piece Neoprene units they can't crack or shatter and won't become "out-of-round" Before you buy, it will pay you to learn why these and other worthwhile features have made them an outstanding choice of American industry.

Write for your FREE copy of JOY connector bulletin MC-108, now!

More than 100 Years of Engineering Leadership M. E. 1151.2

JOY MANUFACTURING COMPANY

HENRY W. OLIVER BUILDING, PITTSBURGH 22, PENNSYLVANIA

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LTD., GALT, ONTARIO

with a "get-acquainted" cocktail social on Wednesday evening. The opening session of the convention was held in the Crystal Room on Thursday morning. At this session, led by Clif White, Empire Electric Co., Ft. Worth, Texas, a welcome was extended to all by H. J. Hill, Hill Electric Co., Wichita, Kansas, NECA vice president for District 5, and by C. M. Warren, mayor of Tulsa. E. R. Cornish, NECA Director of Research, discussed the 14-point program which has been prepared to help contractors realize the common objective—"Sell more for '54".

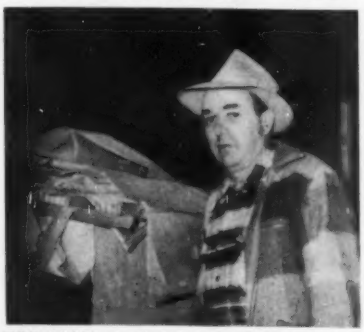
Dan Tracy, president emeritus of the IBEW, also spoke at the morning session. He noted the significance of the joint convention of labor and management and predicted that the spirit of cooperation would carry the industry on to even greater prosperity in the years ahead. He took a dim view of forecasts of depression and said he expected early resumption of increasing business activity. Mr. Tracy recounted memorable experiences, in his life of union activity, which occurred in Tulsa. He expressed the hope that, although retired, he might remain part of the industry. Don Clayton, president of NECA, also spoke before the convention about the growth of the electrical industry and the contribution NECA is making to this growth.

In addition to the various business sessions, the convention included planned recreational events for the ladies and gentlemen.

NISA News

San Diego Chapter held its regular meeting on March 8th at the Hickory House, after which the group adjourned to the new shop of Bay City Electric Works to inspect the plant operated by Charles H. Norris.

The group elected new officers: president, Oliver E. Seeman, Ets-Hokin & Galvan; vice pres., Charles H. Nor-



TOP MAN on the electrical job at New Orleans Public Grain Elevators is Bernard Landry, superintendent for Fischbach-More and Victory Electric Works, New Orleans, La.

MOTOR REPAIR is a subject close to the heart of Foster P. Hiers, vice-president, who directs operations in the large, modern shop of New Orleans Armature Works, New Orleans, La.

ris; secretary-treasurer, Ballard C. Beekmann, California Electric Works.

• • • •

Central District (Chicago) Chapter of NISA, meeting March 9th in the Tower Club, heard Warren Stuart of the Belden Mfg. Co., Chicago, discuss "Selling Ourselves". A sound film was part of Stuart's presentation. The group also heard a report on the corncob cleaning experience of the Arthur Wagner Co.

• • • •

Following dinner at the Mayflower, the Louisville Chapter heard William C. Krauth, Wm. C. Krauth Electric Co. Inc. discuss part-winding starting arrangements. Owen Gollar Jr., Gollar Electric Co., reported on the Region 7 meeting held Feb. 19-20 in Cincinnati, which five Louisville members attended.

• • • •

The "Northwest Conference", a joint meeting of the Vancouver, Portland and Seattle Chapters, took place April 9th at the Benjamin Franklin Hotel in Seattle, with registration beginning at 1:30 PM. The afternoon session had three speakers who discussed motor parts, motor control and credits. Local shops were open for visits between 10 and 12 the following day.

• • • •

Ontario Chapter of NISA met Saturday, March 20th, at the King Edward Hotel in Toronto. After committee reports, the group discussed motor rewinding costs.

• • • •

When Los Angeles Chapter met Feb. 9th at Rodger Young Auditorium, NISA President William M. Hogue discussed the progress of the 1954 and 1955 conventions, to be held in Detroit and Los Angeles, respectively.

The Chapter's guest speaker was Wallace Linville, an engineer of the

Now you can buy all your fittings from ONE dependable source

2-PIECE E.M.T. CONNECTOR (NO LOCK NUTS)

E.M.T. COMPRESSION TYPE CONNECTOR*

"DURO" Connectors are approved as Concrete Tight and for General use. (*Rain Tight)

ALL STEEL... APPROVED

DURO FITTINGS

E.M.T. INDENTOR CONNECTOR

E.M.T. SET SCREW CONNECTOR

YOU'LL SAVE YOUR TIME AND MONEY TOO, when you get all your fittings from DURO. Every fitting is tested by our exclusive process and guaranteed to meet the highest standards of perfection. Sold only through qualified wholesalers.

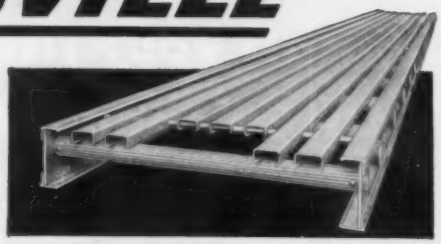
The fastest growing name in fittings

DURO FITTINGS COMPANY

Multi-Products Manufacturing Co.

LOS ANGELES 21, CALIFORNIA

FASTER DECKING with LOUISVILLE ALUMINUM STAGES

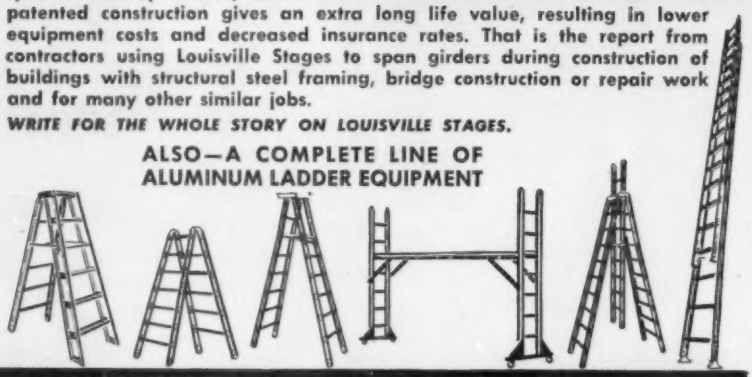


LIGHT WEIGHT — STURDY — RUGGED

20 inch wide Louisville Stages are designed for heavy contractor service. Their light weight speeds labor operations, their patented construction gives an extra long life value, resulting in lower equipment costs and decreased insurance rates. That is the report from contractors using Louisville Stages to span girders during construction of buildings with structural steel framing, bridge construction or repair work and for many other similar jobs.

WRITE FOR THE WHOLE STORY ON LOUISVILLE STAGES.

ALSO—A COMPLETE LINE OF ALUMINUM LADDER EQUIPMENT



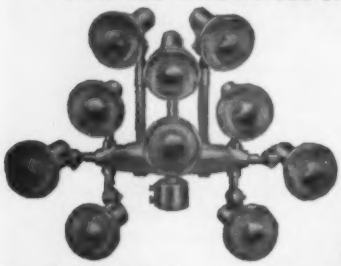
LOUISVILLE LADDER COMPANY
1101 W. OAK ST.— DEPT. E — LOUISVILLE 10, KY.

LOUISVILLE Safe-Weight ALUMINUM PRODUCTS

You Can't Beat— Revere

ELECTRIC MFG. CO. CHICAGO, U.S.A.

HERE'S THE LATEST IN CLUSTER LIGHTS GIVES YOU A MULTITUDE OF COMBINATIONS

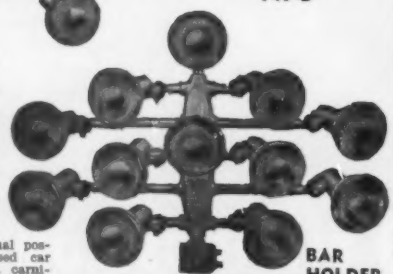


BAR HOLDER MOUNTED HORIZONTALLY

Write for BULLETIN 149-D

Since the introduction of Cluster Lights by REVERE a score or more years ago this type of lighting has literally penetrated all fields. Our latest contribution is the Bar-Type Holder which permits every combination of Cluster Mounting imaginable.

Two sizes are available —one Holder with 7 outlets and one Holder with 13 outlets, offering unusual possibilities for lighting used car lots, golf driving ranges, carnivals, playgrounds, gas stations, factory yards, etc.



BAR HOLDER MOUNTED VERTICALLY

REVERE ELECTRIC MFG. CO. 6017 BROADWAY CHICAGO 40, ILL.
INDOOR & OUTDOOR LIGHTING FOR EVERY NEED

THE REVERE LINE OF FLOODLIGHTS IS COMPLETE

ELIPTOR 300 to 1500 WATT

18 and 20 in. REAR SERVICE FLOODS

"ENDOVAL" MERCURY VAPOR LUMINAIRE

300 to 1000 WATT ENCLOSED FLOODS

AREA LIGHTER WITH TOP FLOODS

MOTOR SERVICE and marine electrical contracting are specialty activities at the Mississippi Valley Electric Co., New Orleans, La., where James L. Pendergrass is general partner.

Petroleum Educational Institute, whose topic was "Lubricants and Their Applications." Dave Halliday of the Baldor Electric Co. St. Louis, was a guest at the meeting.

• • • •

One of the largest and best attended chapter meetings in NISA history, according to those who attended, was the Southwestern Chapter's March 19-20 gathering in Corpus Christi, Tex. at the Robert Driscoll Hotel. Total attendance. including guests, was 98.

• • • •

The new Nisa Display, shown in Los Angeles for the Electrical Maintenance Engineers' Association Show, is available for trade shows and other exhibitions approved by the Publicity Committee.

• • • •

The Detroit Convention Committee has mailed advance registration forms to all NISA members, along with a description of Convention events and hotel room reservation cards.

Charles H. Howard, Chairman of the Convention Finance Committee, reports advance registrations are coming in at a rate to indicate "a record turnout." The registration forms were mailed March 11th from National Headquarters.

Registration fees are $18.00 per person including wives and guests, and $10.00 per family for children under 12 years of age.

Rates at the Hotel Statler range from $5 to $7.50 for single room with shower; $10 for single room with tub and shower; $9.50 to $10.50 for double-bed rooms with showers; $11 to $13 for double-bed rooms with tub and shower; $10 to $10.50 for twin-bed rooms with shower; $11.50 to $14.50 for twin-bed rooms with tub and shower; and $17.50 to $31.50 for suites.

Children under 12 will be furnished

cots without charge. For each person over 12 sharing room with two others, there will be an additional charge of $3.00 per day. Registration fees include admission to all events.

"The Rugged Road Ahead" will be the topic of the Annual Banquet speech of Dr. Alfred P. Haake, consultant to General Motors, at the convention. An author, lecturer and economist, Dr. Haake is a well-known authority on labor, management and politics.

R. C. Parks, assistant sales manager, Howell Electric Motors Co., Howell, Mich., will discuss the new NEMA rerating program in detail, the Program Committee announced.

Howard Davies, Howard Davies, Inc. Philadelphia, one of the industry's leading authorities on electrical testing, will deliver a paper on the subject at the 21st annual NISA Convention. Designer of a dynamometer for small motor testing, who has served on the NISA Engineer's Advisory Committee, Davies is well known in his home city for his work in assisting fellow NISA members with testing problems.

An executive of one of Detroit's oldest and best known shops, Cecil R. Medsker of the Miller-Seldon Electric Co. will discuss "Commutator Repairing" at the convention.

• • • •

Orders for more than 53,000 of the new "Your NISA Repair Shop, a Servant of Industry" pamphlets were received by National Headquarters at press time from more than 100 NISA shops.

• • • •

Representing 219 years of electrical experience, four California NISA members were presented with the Association's 50 year certificates at a meeting of the Northern California Chapter in San Francisco, February 25th.

Two of the men, John J. Van Alstyne, Van Alstyne & Son Electric, Sacramento, and Martin Flatland, Globe Electric Works, San Francisco, were unable to attend the meeting and were represented by their sons, John Van Alstyne and Lloyd Flatland, both active in their fathers' firms.

The others, F. E. Boyd, Pacific Electric Motor Co. Inc., Oakland, and F. W. Buzzell, Buzzell Electric Works, San Francisco, are still active in the management of their companies and were on hand for the ceremonies.

NISA President William M. Hogue made the presentations with Keith M. Noble, Northern California Chapter president acting as master of ceremonies.

• • • •

Penn Electric Motor Company recently acquired the United Electric Motor Service Company in Philadel-

Fouled contacts cause costly burnouts and down-time. Use VAP-OIL-TITE FITTINGS with Plastic Covered Flexible Metallic Conduit for Sure Sealing of wiring on oil, water, dust and vapor tite equipment.

VAP-OIL-TITE'S exclusive threaded bushing not only insures positive grounding but also makes fitting easier to install because a collar covers metal edges making burring unnecessary. Furnished in numerous types with body sizes from 3/8" to 2". Write or wire today for bulletin #MT-104 giving types, sizes and prices.

SIMPLET ELECTRIC COMPANY
3600 Potomac Ave., Chicago 51, Illinois
11 Park Place • New York 7, New York

a new policy...of importance to YOU!

EVERY
Precision
Transformer
now backed by a
5-YEAR GUARANTEE

Protection and assurance you want, need and deserve! It's yours with Precision Transformer's industry-shaking 5-year guarantee! This long-term guarantee is Precision's way of proving complete confidence in the unexcelled dependability of their products. Be protected, be precise—order Precision!

¼ TO 1000 KVA
VOLTAGES TO 15KV

Write today for FREE Catalog and valuable technical data sheets.

These PTC dependability features are yours:
- Built to exceed latest NEMA standards
- Class "B" insulating materials
- Rugged, long-lasting construction
- Easy installation and maintenance
- Efficient, trouble-free service
- Accepted by leading engineers and industries

PTC NEMA

PRECISION TRANSFORMER CORP.
660 West Grand Ave. • Chicago 10, Ill.
SEeley 8-2740

drills 6 inches of concrete per minute

...gives lowest cost per foot of concrete drilled with a

tilden

ROTARY KONKRETE KORE DRILL

Patented core slot expels cuttings automatically

U.S. Pat. No. Re. 23539

Drill straight, clean, ready-to-use holes at speeds up to 6 inches per minute—even through steel reinforced concrete. TILDEN Rotary Koncrete Kore Drills can be used with ordinary electric or rotary air drill. Free Factory sharpening and repair service still available on all Standard TILDEN Drills from 3/16" to 8-inch diameters. Interchangeable shanks for any depth hole.

WRITE TODAY for free, illustrated catalog.

SOLD BY SUPPLY HOUSES EVERY-WHERE

TILDEN TOOL Manufacturing Company
209 Los Molinos • San Clemente, Calif.
Branch: 7111 North Glenwood, Chicago 26, Illinois

Why RELIANCE TIME SWITCHES Are OUTSTANDING VALUES . . .

Heavy Duty "Badger"

THEY ARE GUARANTEED

Every Reliance time switch you sell is guaranteed for 18 months. This complete warranty includes both materials and craftsmanship.

Versatile Model "W"

ACCURATELY RATED

Reliance time switches are built in capacities conforming with recommended NEMA ratings and are listed by Underwriters' Laboratories, Inc.

Low Cost Model "400"

QUALITY CONSTRUCTION

- Minimum of working parts
- Heavy, brass cut gears and steel pinions
- Ground and polished steel shafts
- Non-arcing, pit-resistant contacts
- Expert workmanship

WRITE FOR FREE CATALOG

RELIANCE AUTOMATIC LIGHTING CO.
1937 MEAD ST. RACINE, WIS.

RELIANCE TIME SWITCHES

phia. The shop of the newly acquired company has been modernized and, according to Joe Previty, modernization will cost approximately $80,000. Open House held in the new shop of the company on April 9 and 10 was attended by over 400 people. Very logical line up of machines, use of color schemes and modern equipment plus the hospitality of owners greatly impressed everybody who attended.

• • • •

Foremen's meeting of New England Chapter was held on March 13th at the Town Crest, Worcester. Three extremely interesting visits were well attended. One was to the Morgan Construction Company which gave everyone an insight into the problems found in the design and manufacture of heavy steel mill equipment. Next visit was made to the A. L. Brown Company, where refreshments were served, and then a tour of the Bigelow Company's well organized motor shop completed the morning of inspection.

Back at the Town Crest the afternoon session was opened with a timely talk on the new NEMA frames by Mr. Paul Travers of the Baldor Electric Company. Dave Sandman, chairman of the afternoon program, then conducted the foremen's Idea Contest. A total of 21 ideas were presented. First prize was awarded to Peter Mackey of the White Electric Service for his ingenious method of quickly producing a coil form of wax. Second prize went to W. Burns of the Fitchburg Auto Electric Company for his clever device used to bevel wood wedges quickly and accurately. Third prize was awarded to Gilbert Fontes of Walco Electric for his presentation of a taper chuck remover in the form of matched wedges. Three honorable mentions were named by the judging committee, made up of Alex Shovan, George Lockwood and Bill Kauppert, all of the Metropolitan Chapter.

• • • •

Newly elected officers in the Metropolitan New York Chapter are—H. Engelmann, J. L. Hemphill & Co., North Bergen, N. J., Chairman; W. Kauppert, General Electric Specialty Co., Hollis, New York, Vice-Chairman; and W. Leirer, Queens Elec. Motor Co., Jamaica, New York, Treasurer.

Members of the Executive Board are—W. J. Wheeler, The Maintenance Company, Inc., New York; S. Bojak, Standard Elec. Motor Repair Co., Linden, N. J.; J. P. Ryan, L. J. Land, Inc., New York; R. Patten, Patten Brown Co., New York; R. Mollett, Flushing Electric Corp., Flushing, New York and A. Shovan, Industrial Electric Service Co., Hawthorne, New Jersey, Chairman of Board.

From Walter J. Prise, The Maintenance Company, New York, N. Y.

DATES AHEAD

Illuminating Engineering Society — Regional Conferences: Great Lakes—Sheraton-Cadillac Hotel, Detroit, Mich., May 3-4; Midwestern—Jefferson Hotel, St. Louis, Mo., June 17-19.

Edison Electric Institute—Annual convention, Atlantic City, N. J., June 1-3.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., Week of June 6.

National Industrial Service Assn.—Annual convention, Hotel Statler, Detroit, Mich., June 13-16.

N. Y. State Electrical Contractors and Dealers, Inc. — Annual convention, Saranac Inn., Saranac Inn, N. Y., June 28-July 2.

Western Plant Maintenance Show and Conference — Pan Pacific Auditorium, Los Angeles, Calif., July 13-15.

International Association of Electrical Inspectors—Eastern Section, Atlantic City, N. J., August 30-31; Southwestern Section, Elko, Nevada, September 13-15; Northwestern Section, Portland, Ore., September 23-25; Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.

Illuminating Engineering Society — National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.

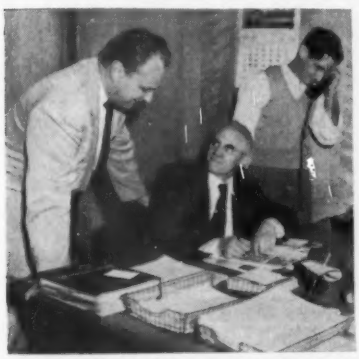
International Association of Electrical Leagues—Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.

Eastern Canada All Electrical Show—Show-Mart Exhibition Hall, Montreal, Quebec, Canada, October 6-10.

New Jersey Council of Electrical Leagues—18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.

National Electrical Contractors Association — Annual convention, Jung Hotel, New Orleans, La., October 27-30.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.



TROUBLE SHOOTING in the field of electric motors is routine with this team of experts at the Motor Div. of Industrial Electric, Inc., New Orleans, La.: (L-R) Earl Wilken; Miles Hutson, Manager; and A. G. Kerth.

NOW A *Fully Automatic* NURSES' CALL SYSTEM

with *simplified* installation and maintenance

- PLUG-IN COMPONENTS
- FACTORY WIRED CENTRAL CONTROL PANEL
- ROOM STATIONS FIT STANDARD OUTLET BOXES

While providing in a fully automatic system the most modern service available to hospitals, the NEW COUCH-CALL is also designed for simplified installation and maintenance.

Plug-in components in the central control panel are easily replaced by spares if necessary. Terminal strips in the central control panel provide for all external circuits. All internal circuits are pre-wired at the factory, and include system power supply. Room stations fit in standard outlet boxes. COUCH-CALL is ideal for both the hospital and the contractor. Write for Bulletin #126 giving complete details.

Simplified Systems of Communication

S. H. Couch Company, Inc.

Private telephones for home and office . . . hospital signaling systems . . . apartment house telephones and mail boxes . . . fire alarm systems for industrial plants and public buildings.

NORTH QUINCY 71, MASSACHUSETTS, U. S. A.

RAKIT®

QUICK MOUNTING BRACKETS

SIMPLIFIED SUPPORTING STRUCTURES

The new one-piece RAKIT Brackets have been specifically designed for quick and easy installation without nuts, bolts, or other fastening devices.

JUST A TWIST OF THE WRIST

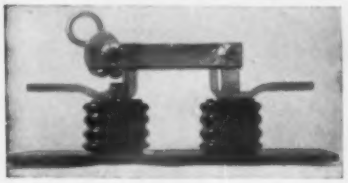
There's no slipping or falling out.

These brackets are ideal for the support of items such as cable trough, instrument tubing trough, conduit, pipe, cable and many others.

The savings in assembly time and labor made possible by this one-piece RAKIT Bracket assure "better support for less cost". Write today for further information. Ask for bulletin 5M.

RAKIT® CORPORATION

711 SOUTH 50th STREET • PHILADELPHIA 43, PA.



Other POWERCRAFT Products
- Bus Clamps, Power Connectors
- Pipe Frame Fittings for 1¼" I.P.S. Pipe
- Indoor and Outdoor Bus Supports

DISCONNECTING SWITCHES

Hook-Stick Operated by

POWERCRAFT

MEET N.E.M.A. STANDARDS

Powercraft disconnects are built of bus bar copper for uniformly high conductivity in the current carrying path. Silver ball contacts assure low temperature rise. Simple, firm locks.

• New catalog just off the press. Write for your copy. A few territories open to qualified manufacturers' agents.

POWERCRAFT CORPORATION
2215 DeKalb St., St. Louis 4, Mo.
Phone PRospect 4532
Since 1932

NEW PRECISION DYNAMOMETER

For determining the force required to actuate delicate mechanisms.

Here is a new instrument that has quickly become an indispensable aid to measure, calibrate and standardize the pressure or power required to actuate fine precision mechanisms and spring tensions of ELECTRIC CONTACTS - RELAYS - CLOCKS - TELEPHONES - BUSINESS MACHINES - MICRO MOTORS for Electric Razors - WINDSHIELD WIPERS - TIME SWITCHES - ETC...

THE DYNAMOMETER IS AVAILABLE IN 2 SIZES WITH OPERATING PRESSURES RANGING FROM 5-15 GRAMS TO 100-1000 GRAMS.

WRITE FOR ILLUSTRATED FOLDER

GEORGE SCHERR CO., Inc.
200-EC Lafayette St. • New York 12, N.Y.

Among the Manufacturers

Headquarters Announcements

Litecraft Mfg. Corp., New York, N. Y.—Edwin R. Manning, vice president in charge of sales.

Buchanan Electrical Products Corp., Hillside, N. J.—George Ustin, chief engineer.

H. K. Porter Co., Pittsburgh, Pa.—R. F. Allen, vice president in charge of the Buffalo Steel Div.

Hi-Voltage Equipt. Co., Cleveland, Ohio—Joseph D. Hoffman, president, succeeding L. C. Hart, who will continue as a director.

Panellit, Inc., Chicago, Ill.—Millard D. Shriver, general sales manager.

Electric Service Engineering Co., Joliet, Ill.—B. F. Pfeifer, executive vice president.

Thor Power Tool Co., Aurora, Ill. has taken over operations of Speedway Mfg. Co. of Chicago, Ill.

Eutectic Welding Alloys Corp., Flushing, N. Y.—L. D. Richardson, national sales and service supervisor.

Pyle-National Co., Chicago, Ill.—Robert Palmer, secretary and treasurer.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—J. W. McMullen, vice president in charge of transformer and switchgear equipment.

Ramset Fasteners, Inc., Cleveland, Ohio—Chas. H. Schminke, field sales manager.

Carborundum Co., Niagara Falls, N. Y.—F. J. Tone, Jr., senior vice president; F. T. Keeler, director of sales.

Advance Transformer Co., Chicago, Ill.—M. D. Orr, vice president, sales; Albert E. Feinberg, vice president, engineering.

Graybar Electric Co., New York, N. Y.—R. B. Sayre, director and member of the executive committee.

General Electric Co., Distribution Assemblies Dept., Plainville, Conn.—Hershner Cross, general manager.

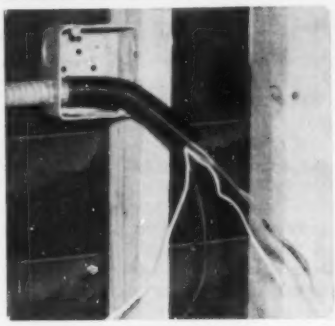
Roller-Smith Corp., Bethlehem, Pa.—Elmer T. Carlson, vice president and general manager.

Corning Glass Works, New Products Div., Corning, N. Y.—Campbell Rutledge, Jr., general sales manager.

Lincoln Electric Co., Cleveland, Ohio—Albert Patnik, dealer sales manager.

Victoreen Instrument Co., Cleveland, Ohio—E. W. Glasenapp, general manager, resistor dept.

General Cable Corporation, New York, N. Y.—Irving T. Bennett, chairman of the board.



The New Time and Labor Saving

WIRE GUIDES

Contractors, Factory Maintenance Men or Repairmen—Wherever, whenever wire has to be guided into conduit, the D.Z. Wire Guide is like having an extra man on the job.

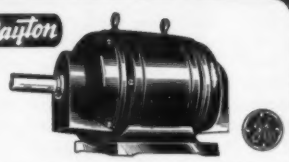
The D. Z. Wire Guide can be used on all types and size of boxes, in any position—with plaster rings on or off. Removes kinks—Protects insulation.

In Standard Sizes—½"—¾"—1" & 1¼"

George G. Zachary

10132 RUSH ST.
EI MONTE CALIF.

GRAINGER'S SUPPLY SERVICE



Use Your Nearby Grainger Stock

Next time you need motors from 1/100 to 60 HP., and other electrical items—save time and money—order from your Grainger Motor Book. You'll get fast shipping and pick-up service from your nearby Grainger Warehouse — and lowest possible prices always. Your Grainger Salesman is at your service too—let him help you. Grainger service can help you build sales—it has for thousands of dealers.

Request on Letterhead ADDRESS DEPT. EC-1

DEALER CATALOG

WHOLESALE EXCLUSIVELY
W. W. GRAINGER, INC.
45 WAREHOUSES—COAST-TO-COAST—SEE PHONE BOOK
GENERAL OFFICE: 118 S. OAKLEY BLVD., CHICAGO 12

for the LONG PULL use

Y-ER EAS
Wire Pulling Lubricant

Only Y-ER EAS has all these features

- Creamy, non-corrosive lubricant. Never greasy or messy.
- Prevents sticking or setting. Specially helpful on saddles and turns.
- Does not run back on cables.
- Never harmful to hands or clothing.
- Permanently non-harmful to cables or conduit.

Write for descriptive booklet

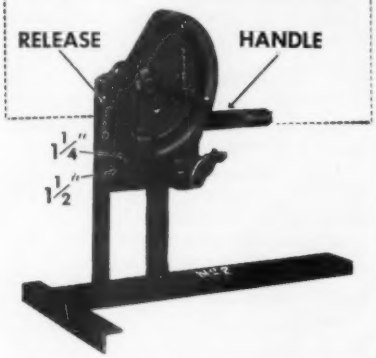
GIVES THE SLIP TO—
Lead, Rubber, Braid or Synthetic Covered Cables

Improved Y-ER EAS tested and approved by the Underwriters' Laboratories, Inc.

AT ALL LEADING ELECTRICAL SUPPLY HOUSES

ELECTRO COMPOUND CO.
3818 W. 150th St., Cleveland 11, Ohio

CHICAGO
PIPE AND CONDUIT BENDERS



The No. 2 Chicago Bender shown will bend 1¼" and 1½" pipe in radii of 7" and 8½".

The No. 1 Chicago Bender will bend ½", ¾", and 1" in 2"—4" and 5½" radii.

Both 1 and 2 are made in thinwall Benders also.

- ***Write for circular giving more details.***

GUSTAVE LIDSEEN, INC.

835 S. Central Ave., Chicago 44, Ill.

- ***Ask your Supply House***

Go after the BIG MONEY in electrical maintenance and repair

Keeping industrial and domestic electrical machinery "going" is a big-paying job for thousands of men—big today—and ever-growing, in this electrical age! Get into this promising line—grow with it into bigger opportunities and get really worthwhile pay. Let this big, practical set of books show you how—as it has hundreds of other men.

Electrical Maintenance and Repair Library

5 volumes 2101 pages 1834 illustrations

This Library starts you right at the beginning and takes you, step-by-step, through every phase of connecting, altering, testing, and repairing all types of electrical equipment. It shows you how to install motors and generators, and rewind motors—how to inspect and repair starters—locate trouble—test induction motors—and MUCH MORE! Hundreds of diagrams make everything crystal-clear. Here are the best on-the-job practices of the experts that will help to put you in the big-pay class—and rate you as an EXPERT electrical worker!....

Includes trouble-shooting book

Worth the price of the entire Library alone is Stafford's **Troubles of Electrical Equipment**, a handy book giving helpful maintenance information, special trouble-shooting charts, explanations of symptoms and causes of machinery troubles, and specific remedies—all designed to help you get those bigger electrical jobs done faster, more efficiently.

Low price—easy monthly payments

We want you to examine this Library for 10 days. If you decide you want the help these books can give, start the small monthly payments, and in a short time they will be yours, right while you have been using them. If you decide you do not want the Library, simply return the books and the matter will be closed.

—SEE IT 10 DAYS FREE—

McGraw-Hill Book Company, Inc., Dept EC-5, 330 W. 42nd St., New York 36, N. Y.

Send me for 10 days' examination the *Electrical Maintenance and Repair Library*. If satisfactory I will send $4.50 in 10 days and $4.00 monthly until the price of $24.50 is paid. If not wanted, I will return the books postpaid.

Print Name .....

Address .....

City .....Zone....State .....

Company.....

Position .....

This offer applies to U. S. only EC-5

SPERO "LARGE AREA" FLOODLIGHTS

OPEN AND ENCLOSED WEATHERPROOF TYPES WITH RANGE OF QUALITY AND BEAM SPREADS TO COVER ANY FLOODLIGHTING NEED.

SERIES A
750-1500W

Latest in design to meet the most exacting lighting requirements. A variety of beam spreads for all applications.

SERIES Y
750-1500W

A low cost unit to meet minimum standards. Highly efficient and with a wide angle distribution to fit any need.

Both units available in Slip Fitter, Wall, Pipe and Cross Arm mountings

SPERO also makes "GUARANTEED" PORCELAIN ENAMEL REFLECTORS...FLOODLIGHTS...VAPOR-TIGHT UNITS...INSULATORS...SWITCHPLATES

THE SPERO ELECTRIC CORPORATION
20500 St. Clair • Cleveland 17, Ohio

Save work with a
HYKON CABLE REELIFT

Handle 2000 lb. reels

A quick and easy, practical lift for heavy cable reels. Eliminates problem of broken reels. No jacks, no tugging or rolling. Reelift has slip fittings on axle to permit simple loading and adjustment for any size reels. Two models: RL25 for reels 25 x 36" diam.; RL31 for reels 31 x 42" diam. Hundreds in use; rugged welded frame. Write for new Catalog.

HyKon MANUFACTURING CO.
Station A, ALLIANCE, OHIO

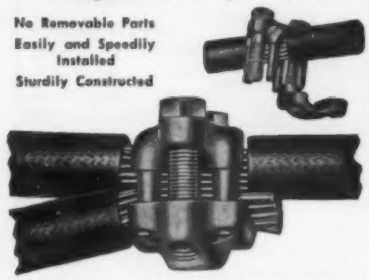
CLAMP AND LOCK YOUR CONNECTIONS { THE K&H WAY

This

SWIVEL U-BOLT CONNECTOR

is designed to do just that...

No Removable Parts
Easily and Speedily Installed
Sturdily Constructed



MEET ALL REQUIREMENTS

85% Copper Alloy • Ample Strength
High Conductivity • Unaffected by Vibration
Moisture Resistant
Sizes Up to 1,000,000 CM.
Approved by Engineers

Specify K&H for YOUR Next Job

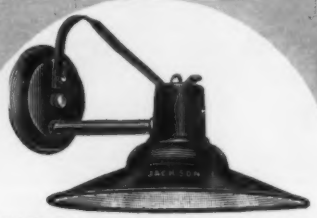
For More Details, Sizes and Prices
WRITE FOR CATALOG 5LC

KRUEGER & HUDEPOHL
[illegible] VINE ST. • CINCINNATI 2, OHIO

JACKSON
PORCELAIN ENAMELED
YARDLIGHTS

No. 8972
8974 — 8976

• A life-time YARDLIGHT that "Won't Blow Down." Modern design—one piece—heavy gauge steel finished with three coats of Vitreous Porcelain Enamel. Completely wired and assembled. Listed by U. L.—approved for R. E. A. installation.

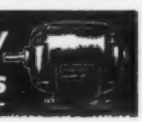


ORNAMENTAL LIGHTING BRACKET NO. 6587

Finish is black and brass. Height is 7½"—extends 14". Completely wired. Individually packed. Accommodates 100 watt bulb or PAR lamp and is for use in garages, motels, side entrance of public buildings, ranch type homes, and such places where ornamental brackets are needed.

JACKSON ELECTRICAL COMPANY
900-910 W. VAN BUREN ST. CHICAGO 7, ILL.

We'll give you quick delivery and lowest prices



ELECTRIC MOTOR PARTS

on parts for Brown & Brockmeyer • Century • Delco • General Electric • Jack & Heintz • Leland • Marathon • Packard • Redmond • Sunlight • Wagner • Westinghouse—*motors*

Write for catalog—on your letterhead—to

The HARRY ALTER CO., Inc.

1728 S. Michigan Ave.
Chicago, Illinois

134 Lafayette St.
New York, N. Y.

WHOLESALE ONLY

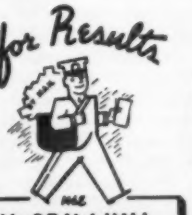
HARRY ALTER gives you snappy service!

IT TAKES TWO

DISPLAY ADVERTISING • AROUSES INTEREST • CREATES PREFERENCE
DIRECT MAIL • GETS PERSONAL ATTENTION • TRIGGERS ACTION

After your prospect has been convinced by Display Advertising, he still must act. A personalized mailing piece, is a powerful action-getter. Send for our Industrial Direct Mail Catalogue, 150 lists available.

for Results



use McGRAW-HILL DIRECT MAIL LIST SERVICE

Direct Mail Division,
McGraw-Hill Publishing Co., Inc.
330 West 42 St., N. Y. 36, N. Y.

Please forward my free copy of the McGraw-Hill "Industrial Direct Mail Catalogue."

Name_____

Company_____

Address_____

City_____ State_____

Regional Appointments

NEW ENGLAND

Sessions Clock Co.: F. J. Ritzer, district manager.

MIDDLE ATLANTIC

Remington Corp.: Edward McIntosh, northeastern regional sales manager, New York, N. Y.

Graybar Electric Co.: W. G. Trometter, manager of new branch in New Brunswick, N. J.

Continental Electric Equipment Co.: Thomas Kelly, regional manager for eastern Pennsylvania, southern Jersey and Delaware.

Thomas & Betts Co.: C. A. Biddulph, eastern division manager.

Sessions Clock Co.: Leonard A. Roulier, district manager for metropolitan New York; office in New York.

SOUTH ATLANTIC

Allis-Chalmers Mfg. Co.: C. F. Kucera, regional representative for transmission equipment, Atlanta, Ga.

Benjamin Electric Mfg. Co.: A. A. Michel, sales manager for Nashville, Tenn., territory.

Continental Electric Equipment Co.: Murray C. Nelson, regional manager for District of Columbia, Md. and Va.

Anaconda Wire & Cable Co.: Jack Saunders, manager, Florida district, Tampa, Fla.

General Dynamics Corp., Electro Dynamic Motor and Generator Div.: E. R. Campbell, southern manager, Atlanta, Ga.

Century Electric Co.: T. K. McKamy, district manager, new branch office in Charlotte, N. C.

Graybar Electric Co.: L. A. Shaw, manager of new branch at Rocky Mount, N. C.

EAST CENTRAL

General Electric Co., Carboloy Dept.: R. J. Contrucci, sales representative for Detroit, Mich., district.

Allis-Chalmers Mfg. Co.: H. H. Ackerman, regional representative for transmission equipment, Cleveland.

Graybar Electric Co.: T. H. Todd, district manager for Cincinnati.

WEST CENTRAL

Thomas & Betts Co.: H. C. Moses, Jr., manager of western sales division.

Line Material Co.: Earle W. Williams, central division manager, Kansas City, Mo.

Federal Electric Products Co. and Pacific Electric Mfg. Corp.: D. L. Orton, regional manager.

WEST

Anaconda Wire & Cable Co.: F. D. Dickey, San Francisco district mgr.

Remington Corp.: R. C. Starke, sales representative for mountain states, Denver, Colo.

SEARCHLIGHT SECTION

(Classified Advertising)

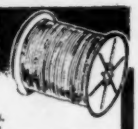
EMPLOYMENT: "OPPORTUNITIES" :EQUIPMENT
BUSINESS: :USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Position Wanted and Individual Selling Opportunity Wanted undisplayed rate is one-half of above rate, payable in advance.
Box Numbers in care of our New York, Chicago & San Francisco offices count as one additional line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
New Ads Received by May 21st at the New York office, 330 W. 42nd St., New York 36, N. Y., will appear in the June Issue subject to limitations of space available. E.C.M.

Equipment Wanted or For Sale Advertisements acceptable only in Displayed Style.
Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $11.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column. 3 columns—30 inches—to a page.

Communication Problems Solved! with ARMY FIELD TELEPHONES & WIRE



RING AND TALK UP TO 20 MILES

Perfect for MINING . . . INDUSTRIAL . . . AND ENGINEERING Projects.
Link scattered operations with central headquarters. Save time and steps.
Simple to install and operate. String 2-conductor wire, connect from 2 to 8 telephones on same line. Ring and talk. Powered by standard flashlight batteries.
NO FURTHER MAINTENANCE REQUIRED!

EE-8 Army Field telephones, factory reconditioned—like new. Each phone . . . $22.50 . . . per pair $42.50.
EE-91 Field Telephones, factory check. Per pair $34.50.
OTHER LOW COST PHONES AVAILABLE NOW!

3000 MILES of TELEPHONE WIRE at 1947 PRICES!

BLASTING AND COMMUNICATION WIRE

Former price . . . $22.50 NOW . . . $16.00 per mile. As low as $3.25 per /M ft. in mile reels.
STOCK UP AT THESE BIG SAVINGS.
Ideal wire for shot firing—telephone—intercom—bell and signal use. Packed 2640 ft. and 5280 ft. on no-charge reels. Minimum order 2640 ft. Sample on request.

ALL PURPOSE—ALL WEATHER

Designed for tough usage by U. S. Signal Corps, W-110B 2-conductor, three .0135" copper, four .013" steel strands per conductor. Rugged rubber and fabric weather-proof insulated. Steel strands are incorporated for extra tensile strength and are tinned and treated for efficient conductivity.

W-110B 2640 ft. reels approx. 80 lbs. $9.00
W-110B 5280 ft. reels approx. 160 lbs. $16.00
W-130 #22 gauge, light weight, new 2-conductor, copper steel plastic insulation wire.
10,560 ft. reels approx. 90 lbs. $34.50
3,500 ft. reels approx. 20 lbs. $16.00

Send Check or M.O. No C.O.D.'s
Terms: Rated firms send P.O. Net 30 Days
Non-rated send check with order.
Prices F.O.B. Sacramento, Calif.
California Buyers Add 3% Tax
WRITE FOR FREE FOLDER

LORIS SALES P. O. BOX 1896 DEPT. CM5 SACRAMENTO, CALIF.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

SALES MANAGER or Salesmen with managerial ability needed by one of Chicago's leading and fastest growing power and light distribution transformer manufacturers selling to electrical contractors, engineers, wholesalers and industrials. Must have good knowledge of transformer applications. Very good opportunity for the right party. Replies confidential. Box SW-2454, Electrical Construction & Maintenance.

EMPLOYMENT SERVICE

OVERSEAS EMPLOYMENT guide for engineers, constructors & admin p'sn'l. Send $1 Cove-McKane Int'l. Box 126-EC, NY 1, NY.

POSITION WANTED

ELECTRICIAN WITH master licenses in N. Y. C., Nassau, Suffolk, Westchester & Putnam Counties, Connecticut & Northern New Jersey, desires position with reputable electrical contractor or manufacturer. Box PW-2592, Electrical Construction and Maintenance.

BUSINESS OPPORTUNITY

British chartered electrical, mechanical engineer with downtown consulting offices in Buenos Aires, established 1941, seeks partnership or arrangement for handling S. American projects of American consultants. BO-2151, Electrical Construction & Maintenance.

TRANSFORMER MFG. BUSINESS
FOR SALE
Established Chicago mfg. of air-cooled transformers doing annual volume of $600,000.00 wishes to sell. Principals available to remain with operation.
BO-2482, Electrical Construction & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL WIRE AND CABLE
—YOUR BEST SOURCE—
- for every industrial and power application
- odd lengths—long and short—reasonably priced
- largest stock in Midwest
- varnished cambric—leaded—neoprene

Let us quote on requirements—send your inquiries

DELIVERY
QUICK . . . from stock
We'll also buy your Surplus
Branch Offices
Houston—Yukon 5547
Los Angeles—DUnkirk 7-3265
UNIVERSAL Wire and Cable Co.
2962 N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

ELECTRIC WIRE IN STOCK
Underground, Overhead, Welding, Asbestos, Telephone, Elevator, High-voltage Cables, Plus More.
EASTERN ELECTRIC SALES CO.
5425 Pennsgrove St., Phila., Pa. GR-4-5300

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK
"A Unique Tool of the Trade"
WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.
4102 Wilson Road Kenosha, Wis.

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction—Maintenance—Repairs

SALESMAN WANTED To sell our famous Formula No. 640 colorless masonry sealer, silicone water repellent, concrete hardener, floor mastic, admix for topping floors always cold and wet, curing compound, rubber enamel, roof coatings, gilsonite paints, floor wax containing duPont's Ludox. Thirty products. Contact building owners and managers, contractors, etc. Commission. Territory.
Name this magazine. Write Haynes Products Co., 4007 Farnam St., Omaha 3, Nebr.

LINDELL BORING ATTACHMENT
Fast, easy boring
Drill attachment for easy boring in hard to reach places, overhead or below without adjusting.
Fits any ½" drill.
Reduced speed for more power.
At your jobber, or write.
LINDELL ELECTRIC
115 East 58th Street
Minneapolis 19, Minn.

A TRADE-MARK
HINDLE TRANSFORMER COMPANY INC. H
YOU CAN RELY ON
Backed by more than 15 years experience in transformer design and manufacture.
HINDLE TRANSFORMER CO., INC.
Woods Church Road, Flemington, N. J.

A Good Habit

The Where-to-Buy Section of Electrical Construction and Maintenance supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue—a *good* habit!

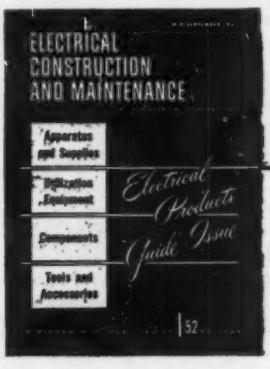
Advertising In This Issue

• Adam Electric Co., Frank..... 15
Allen-Bradley Co. 209, 210
Allis-Chalmers Mfg. Co.....19, 41
Allis Co., The Louis..... 55
• All-Steel Equipment, Inc..... 128
Alter Co., The Harry..... 244
Aluminum Company of America..54, 216
American Tel. & Tel. Co..... 8
Amplex Corporation 196
Anaconda Wire & Cable Co.....72, 73
Anderson Brass Works, Inc..... 169
Appleton Electric Co..... 2
Arrow-Hart & Hegeman Elec. Co...67, 68
Art Metal Co., The..... 147
Auth Electric Co., Inc..... 48
Automatic Switch Co..... 232
• Barth Corp., The..... 166
Bell Telephne System..... 8
Benjamin Electric Mfg. Co..... 16
Biddle Co., James G..... 213
Black & Decker Mfg. Co., The..... 176
Black Mfg. Co., M..... 64
• Borthig Co., Inc., George C..... 181
Briegel Method Tool Co..... 14
Broan Mfg. Co., Inc..... 233
Bryant Electric Co., The..... 18
• Buffalo Forge Co..... 212
BullDog Electric Products Co..... 76
• Burndy Engineering Co..... 117
Bussmann Mfg. Co.....50, 51
Century Electric Co..... 65
Champion Lamp Works..... 194
Clark Controller Co., The.....133, 134
Columbia Electric Mfg. Co..... 226
• Cope, Inc., T. J..... 156
Couch Co., Inc., S. H..... 241
• Crescent Ins. Wire & Cable Co..... 49
• Crouse-Hinds Co.....6, 7
• Curtis Lighting, Inc..... 189
Cutler-Hammer, Inc. 17
• Day-Brite Lighting, Inc..... 142
• Delco Products Division of
General Motors Corp..... 59
Diehl Manufacturing Co. 47
Dossert Mfg. Corp. 146
• Dow Corning Corp. 137
Du Pont deNemours & Co., Inc., E. I. 205
Duro Fittings Company 237
Economy Fuse & Mfg. Co..... 10
Edwards Co., Inc..... 187
Efficiency Electric & Mfg. Co..... 232
Electrical Construction & Maintenance 118
Electrical Fittings Corp..... 182
Electrical Products Guide.....227, 228, 229, 230
Electro Compound Co..... 243
Electro Dynamic Div. of
General Dynamics Corp..... 177
Erie Electric Co., Inc..... 218
Fairbanks, Morse & Co.....172, 173
• Federal Electric Products Co..... 71
Fullman Mfg. Co..... 140
Furnas Electric Co..... 148
• G & W Electric Specialty Co..... 222
• Garden City Plating & Mfg. Co..... 190
• Gedney Electric Co. 31
General Cable Corp..... 57
• General Electric Co.
• Apparatus Sales Div.....Second Cover 33, 34, 35, 36, 37, 38, 39, 178, 179
• Construction Materials Div. Fourth Cover 150, 167
Distribution Assemblies Dept..... 62
General Electric Supply Co.....185, 192
Grainger, Inc., W. W..... 242
• Graybar Electric Co., Inc..... 82
Greenlee Tool Co..... 214
• Guth Co., Edwin F., The..... 63
Haynes Products Co..... 245
Hazard Insulated Wire Works....23, 60
Heinemann Electric Co..... 206
Helwig Company 208
Hindle Transformer Co., Inc..... 245
Hubbell, Inc., Harvey.....160, 161
Hykon Mfg. Co. 243
• Ideal Industries, Inc.....198, 199
• Ilsco Copper Tube and Products, Inc. 234
• I-T-E Circuit Breaker Co.....164, 165
• Jackson Electrical Co..... 244
Jenkins Bros. 5
Joy Mfg. Co..... 236
Kaiser Aluminum & Chemical Sales, Inc. 191
• Killark Electric Mfg. Co..... 163
Kirlin Co., The 46
Klein & Sons, Mathias 132
Krueger & Hudepohl 244
• Leviton Mfg. Co..... 219
• Lidseen, Inc., Gustave..... 243
• Linde Air Prod. Co., The Unit of Union Carbide & Carbon Corp..... 234
Lindell Electric Co..... 245
Litecontrol Corp. 144
Louisville Ladder Co..... 238
Luminous Ceilings Inc..... 207
Marcus Transformer Co., Inc..... 138
McCabe-Powers Auto Body Co..... 174
• McGill Mfg. Co., Inc..... 22
McGraw-Hill Book Co. 243
• Midwest Electric Mfg. Co. 154
• Minerallac Electric Co..... 208
Minnesota Mining & Mfg. Co..... 26
• Mitchell Mfg. Co..... 149
Monarch Fuse Co., Ltd..... 224
National Carbon Co..... 188
Natvar Corporation 9
Newman Industries (America) Inc..... 27
• Okonite Co., The.....23, 60
Orangeburg Mfg. Co., Inc..... 74
• Paragon Electric Co..... 215
Paranite Wire & Cable Division Essex Wire Corp. 70
• Parr Mfg. Corp. 136
• Pass & Seymour, Inc. 58
• Phelps Dodge Copper Products Corp. 158, 159
• Pittsburgh Standard Conduit Co..... 78
Porter-Cable Machine Co..... 231
Potter & Rayfield, Inc..... 162
Powercraft Corporation 242
• Precision Transformer Corp..... 236
• Preformed Line Products Co..... 204
Pyle-National Co., The..... 69
Pyramid Instrument Corp. 131
• Quadrangle Mfg. Co..... 235
Rakit Corporation 241
Ramset Fasteners Inc..... 195
Rawlplug Co., Inc., The..... 197
• Reliance Automatic Lighting Co..... 240
Remington Arms Co., Inc..... 139
Republic Steel Corp.....24, 25
Revere Electric Mfg. Co..... 238
Ridge Tool Co., The..... 130
RLM Standards Inst., Inc..... 30
Rockbestos Products Corp..... 223
Roebling's Sons Corp., John A..... 45
• Rome Cable Corp.....20, 21
S & C Electric Co..... 75
Sangamo Electric Co.....42, 43
Scherr Co., Inc., George..... 242
• Signal Eng. & Mfg. Co..... 226
Simplet Electric Co..... 239
Simplex Wire & Cable Co..... 11
Smithcraft Lighting Division 53
• Sorgel Electric Co. 220
Spang-Chalfant (Div. of the National Supply Co.) 183
Spero Electric Corp., The..... 243
Square D Company..Third Cover, 12, 13
• Standard Transformer Co., The..... 236
Steel & Tubes Division.....24, 25
Sterling Electric Motors..... 52
Superior Electric Co., The..... 141
Superior Instruments Co..... 225
• Sylvania Elec. Products, Inc..... 40
Thomas & Betts Co., Inc..... 56
Thor Power Tool Co..... 186
• Tilden Tool Mfg. Co..... 240
Toledo Pipe Threading Mach. Co., The 182
• Triangle Conduit & Cable Co., Inc. 28, 29
• Union Carbide & Carbon Corp., The Linde Air Prod. Co. Unit.... 234
Unistrut Products Co. 61
• United States Rubber Co.....1, 80
Up-Right Scaffolds 202
Van Cleef Bros., Inc..... 66
• Wagner Electric Corp.....180, 200
Wakefield Brass Co., F. W., The.... 175
• Western Insulated Wire Co.....170, 171
Westinghouse Electric Corp.
(Lighting Division) 44
(Pittsburgh).119, 120, 121, 122, 123, 124, 125, 126
• Wheeler Reflector Co. 221
Where to Buy..... 245
Whitehead Stamping Co..... 168
• Wiegand Co., Edwin L..... 211
Youngstown Sheet & Tube Co., The 32
Zachary, George G..... 242

■

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 245
Selling Opportunities Offered 245
Position Wanted 245
Employment Services 245
EDUCATIONAL
Books 245
BUSINESS OPPORTUNITIES
Offered 245
EQUIPMENT
(Used or Surplus New)
For Sale 245
WANTED
Equipment 245



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the Index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

For 50 Years....

THE WORLD'S MOST POPULAR SAFETY SWITCHES

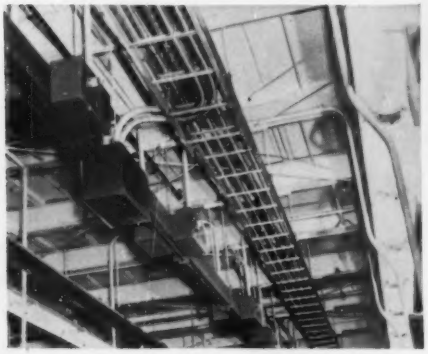
COMPARE... LINE FOR LINE, AND FEATURE FOR FEATURE

THEY COST NO MORE... WHY SETTLE FOR LESS?

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

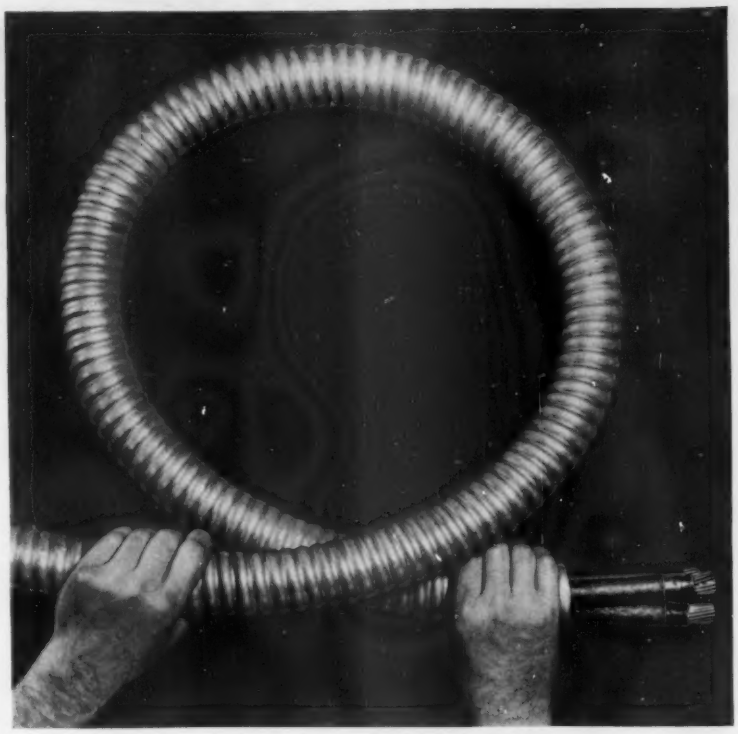
SQUARE D COMPANY

A lightweight aluminum trough is sufficient support for G-E V-c interlocked armor cable. Use troughs for long runs of single cable and keep splicing to a minimum. All splices are a simple mechanical job done right on the site.



The cable is always accessible for alterations and additions. Use racks for multiple runs of large cable and baskets for small cables. The cable is easy to string and can often be pulled by hand around bends and angles.

Support single cables by messengers attached to existing buildings and beams for low-cost runs between buildings and across open plant areas.



G-E V-c interlocked armor cable is easily bent around sharp corners and projections and weighs only about a third as much as most cable systems. There is an easy method of installation to meet any condition.

This lightweight, flexible G-E cable SPEEDS INSTALLATION of feeder systems

The light weight and extreme flexibility of G-E V-c interlocked armor cable systems make them adaptable to all wiring conditions. Right angle bends, long runs and close-quarter installations are easier to make and cost less than conventional cable and conduit. Using G-E V-c interlocked armor cable assures your customers of long-lasting, trouble-free feeder systems. *To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.*

For more information on the ease of installation and the economies of using G-E V-c interlocked armor cable, write Section W131-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

REWIRE AMERICA
WITH GENERAL ELECTRIC WIRING SYSTEMS

You can put your confidence in—

GENERAL ELECTRIC